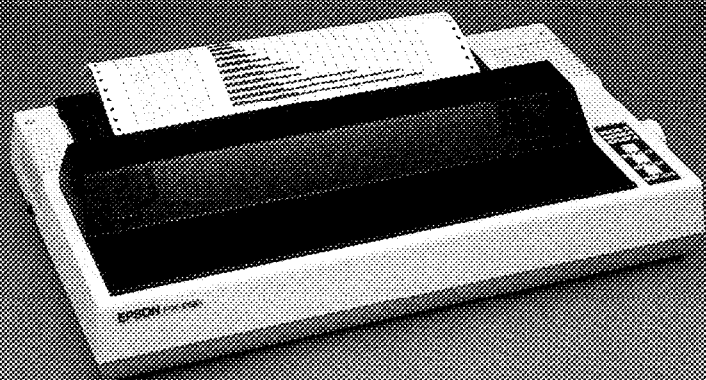


EPSON

# User's Manual



FX-286™ Printer

**EPSON®**

**FX-286™ Printer**

**User's Manual**

## FCC COMPLIANCE STATEMENT FOR AMERICAN USERS

---

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

### WARNING

The connection of a non-shielded printer interface cable to this printer will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment. If this equipment has more than one interface connector, do not leave cables connected to unused interfaces.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, mechanical, photocopying, recording or otherwise, without the prior written permission of Epson Corporation. No patent liability is assumed with respect to the use of the information contained herein. While every precaution has been taken in the preparation of this book, Epson Corporation assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

Applesoft is a trademark of Apple Computer, Inc.

Centronics is a registered trademark of Data Computer Corporation.

Epson is a registered trademark of Epson Corporation.

FX-286 is a trademark of Epson America, Inc.

IBM is a registered trademark of International Business Machines Corporation.

Microsoft is a trademark of Microsoft Corporation.

QX-10 is a registered trademark, and QX-16 is a trademark of Epson America, Inc.

Copyright © 1985 by Epson Corporation  
Nagano, Japan

# Contents

Introduction .....	Intro-1
<b>Setting Up the FX-286</b> .....	1-1
Unpacking Your Printer .....	1-1
Installing the paper feed knob .....	1-2
Selecting the Right Location .....	1-2
Installing the Ribbon .....	1-4
Replacing the ribbon .....	1-7
Loading Continuous-feed Paper .....	1-7
Loading single-sheet paper .....	1-13
Installing the paper separator .....	1-14
Turning the Power On .....	1-15
Operating the Control Panel .....	1-16
OFF LINE/ON LINE .....	1-17
FORM FEED/NLQ .....	1-17
LINE FEED/DRAFT .....	1-17
The NLQ Mode .....	1-18
Setting the Top-of-Page Position .....	1-18
Adjusting the paper-thickness lever .....	1-19
Running the Self Test .....	1-21
Connecting Your Printer to Your Computer .....	1-22
Printing Your First Document .....	1-24
 <b>2 Using the FX-286 with Commercial Software</b> .....	 2-1
Using the FX-286 with Word Processors .....	2-1
The IBM Proprinter mode .....	2-2
Using the FX-286 with Other Applications Programs .....	2-2
 <b>3 SelecType</b> .....	 3-1
SelecType Operation .....	3-1
Turning SelecType on .....	3-1
Selecting typesyles .....	3-2
SelecType exercise .....	3-3
Mode combination .....	3-5
Skip-over-perforation .....	3-6
SelecType Tips .....	3-6

<b>4</b>	<b>Elements of Dot-Matrix Printing and Computer/Printer Communications .....</b>	<b>4-1</b>
	The Print Head .....	4-1
	Changing Widths .....	4-2
	Computer-to-Printer Communications .....	4-3
	ASCII Codes .....	4-3
	Control Codes .....	4-4
	ESCAPE Sequences .....	4-4
	Demonstration Programs .....	4-4
	Running BASIC Programs .....	4-5
	How to Send Control Codes to the Printer .....	4-6
<b>5</b>	<b>FX-286 Features .....</b>	<b>5-1</b>
	IBM Proprinter Mode .....	5-1
	Pica Printing .....	5-3
	Changing Widths .....	5-3
	Cancelling Codes .....	5-4
	Resetting the Printer .....	5-4
	Disabling a program's reset code .....	5-5
	Width Comparison .....	5-5
	Near Letter Quality Mode .....	5-6
	Print Enhancements and Special Characters .....	5-7
	Emphasized mode .....	5-7
	Double-strike .....	5-8
	Double-width mode .....	5-9
	Mode combinations .....	5-9
	Underline mode .....	5-10
	Proportional mode .....	5-11
	Master Select .....	5-11
	Superscript and subscript .....	5-13
	International characters .....	5-14
	Page Formatting .....	5-16
	Margins .....	5-17
	Skip-over-perforation .....	5-18
	Line spacing .....	5-18
	Paper-out Sensor .....	5-19

6	<b>Introduction to Dot Graphics</b> .....	<b>6-1</b>
	Dot Patterns .....	6-2
	The Print Head and Graphics .....	6-2
	Graphics Mode .....	6-3
	Pin Labels .....	6-4
	First Graphics Programs .....	6-5
	WIDTH Statements .....	6-6
	Multiple-line Exercise .....	6-6
	Density Varieties .....	6-8
	Reassigning Code .....	6-10
	Column Reservation Numbers .....	6-10
	Designing Your Own Graphics .....	6-11
	String variables .....	6-14
7	<b>User-defined Characters</b> .....	7-1
	Defining Your Own Characters .....	7-1
	Designing Process .....	7-2
	Definition program 1 .....	7-4
	Running the program .....	7-5
	Definition program 2 .....	7-7
	Running the program .....	7-8
	Index .....	Index-1

## Appendixes

<b>A</b>	<b>Defaults and DIP Switches</b> .....	<b>A-1</b>
	Default Settings .....	A-1
	The DIP Switches .....	A-2
	Selecting the IBM Proprinter mode .....	A-3
	Printing the Alternate and All Print character sets ..	A-3
	Running the self test in the IBM Proprinter mode ..	A-3
<b>B</b>	<b>Loading Single-sheet Paper in the FX-286</b> .....	<b>B-1</b>
	Removing the Tractor Unit .....	B-1
	Loading Single-sheet Paper .....	B-2
	Disabling the paper-out sensor .....	B-3
	Installing the Tractor Unit .....	B-4

<b>C</b>	<b>Troubleshooting and Problem Solving</b> .....	C-1
	Troubleshooting .....	<b>C-1</b>
	Double-spacing or overprinting .....	C-1
	Paperloading.. .....	C-1
	Paper advancing .....	C-2
	Tabbing .....	C-2
	Paper-out sensor will not turn off .....	C-2
	Self-adhesive labels .....	C-2
	Graphics Solutions .....	C-2
	Cancelling Unwanted Functions with SelecType ....	C-3
	Beeper Error Warnings .....	C-4
	Using the Hex Dump Mode to Solve Problems ....	C-4
	System Solutions .....	C-6
	IBM PC BASIC solutions .....	C-7
	Applesoft BASIC solutions .....	C-8
	QX-10 and QX-16 Solutions .....	C-8
	User-defined Character Solutions .....	C-8
	Defining more than three characters .....	C-8
	Data numbers for user-defined characters .....	C-9
	WIDTH statements .....	C-9
<b>D</b>	<b>Maintenance</b> .....	D-1
	Changing the Print Head .....	D-1
	Removing the old print head .....	D-1
	Installing the new print head .....	D-2
<b>E</b>	<b>The Parallel Interface</b> .....	E-1
	Data Transfer Sequence .....	E-3
	Interface timing .....	E-3
	Printing enabled/disabled signals and control conditions .....	E-3
<b>F</b>	<b>Technical Specifications</b> .....	F-1
	Printing .....	F-1
	Character sizes .....	F-1
	Characters per line .....	F-2
	Paper .....	F-2
	Printer.. .....	F-2
	Dimensions and weight .....	F-3
	Environment.. .....	F-3
	Interface .....	F-4

<b>G</b>	<b>Epson Mode Command Summary .....</b>	<b>G-1</b>
	Software Commands in Numerical Order .....	G-2
	Epson Mode Commands .....	G-5
	Near Letter Quality Mode .....	G-7
	Character Width .....	G-7
	Print Enhancement .....	G-10
	Page Formatting .....	G-14
	Margins .....	G-14
	Line spacing .....	G-15
	Form feed and page length .....	G-18
	Tabs.. .....	G-19
	Word Processing .....	G-21
	Graphics .....	G-24
	User-defined Characters .....	G-27
	MSB Control .....	G-29
	Other Codes .....	G-30
<b>H</b>	<b>FX-286 Character Fonts-Epson Mode .....</b>	<b>H-1</b>
	How to Use the Charts .....	H-2
	Converting hexadecimal numbers to decimal numbers .....	H-2
<b>I</b>	<b>ASCII Code Conversion Chart and Proportional     Width Tables .....</b>	<b>I-1</b>
	ASCII Code Conversion Chart .....	I-2
	Proportional Width Table .....	I-6
	International Character Width Table .....	I-7
<b>J</b>	<b>IBM Proprinter Mode Command Summary .....</b>	<b>J-1</b>
	Selecting the IBM Proprinter Mode .....	J-2
	Printing the Alternate and All print character sets ..	J-2
	Running the self test in the IBM Proprinter mode ..	J-3
	Software Commands in Numerical Order .....	J-4
	IBM Proprinter Mode Commands .....	J-7
	Character Width .....	J-9
	Print Enhancement .....	J-11
	Page Formatting .....	J-15
	Margins .....	J-15
	Line spacing .....	J-16
	Form feed and page length .....	J-18
	Tabs.. .....	J-20
	Graphics .....	J-21
	Other Codes .....	J-24



<b>K</b>	<b>FX-286 Character Fonts-IBM Proprietary Mode . . . .</b>	<b>K-1</b>
	How To Use the Charts . . . . .	K-2
	Converting hexadecimal numbers to decimal numbers . . . . .	K-2

## Figures

1-1	Printer parts . . . . .	1-1
1-2	Installing the paper feed knob . . . . .	1-2
1-3	Front view of FX-286 . . . . .	1-3
1-4	Rear view of FX-286 . . . . .	1-4
1-5	Tightening the ribbon . . . . .	1-5
1-6	Loading the ribbon cartridge . . . . .	1-6
1-7	Positioning the ribbon . . . . .	1-7
1-8	Continuous-feed paper with printer stand . . . . .	1-8
1-9	Continuous-feed paper without stand . . . . .	1-8
1-10	Removing the locking tabs from the tractor unit . . . . .	1-9
1-11	Moving the pin-feed holders . . . . .	1-10
1-12	Opening the pin-feed covers and paper release lever . . . . .	1-11
1-13	Adjusting the paper supports; loading paper . . . . .	1-12
1-14	Fitting the paper over the pin feeds . . . . .	1-13
1-15	Installing the paper separator . . . . .	1-14
1-16	Turning on the power switch . . . . .	1-15
1-17	The FX-286 control panel . . . . .	1-16
1-18	Top-of-page position . . . . .	1-19
1-19	Paper-thickness lever . . . . .	1-20
1-20	FX-286 self test in Epson draft and NLQ modes .. . . .	1-22
1-21a	Connecting a parallel interface cable . . . . .	1-23
1-21b	Connecting a parallel interface cable . . . . .	1-23
3-1	Turning SelecType on . . . . .	3-2
4-1	A capital T . . . . .	4-1
4-2	The three widths of the FX-286 . . . . .	4-2
5-1	IBM character sets . . . . .	5-2

<b>6-1</b>	Pin labels .....	<b>6-4</b>
<b>6-2</b>	Calculating numbers for pin patterns .....	<b>6-5</b>
<b>6-3</b>	Designing in different densities .....	<b>6-12</b>
<b>6-4</b>	Arrow design .....	<b>6-12</b>
<b>6-5</b>	First line of arrow figure .....	<b>6-13</b>
<b>7-1</b>	FX-286 dot-matrix characters .....	<b>7-2</b>
<b>7-2</b>	Grid for designing draft characters .....	<b>7-3</b>
<b>7-3</b>	Correct and incorrect designs .....	<b>7-3</b>
<b>7-4</b>	Design for character .....	<b>7-4</b>
<b>7-5</b>	Using the bottom eight rows .....	<b>7-6</b>
A-1	DIP switch location .....	A-2
A-2	IBM Proprinter mode self test .....	A-4
B-1	Removing the tractor unit .....	B-1
B-2	Loading single-sheet paper .....	B-2
B-3	Installing the tractor unit .....	B-4
C-1	Hexadecimal codes in order .....	C-6
D-1	Print head replacement .....	D-2
E-1	Parallel interface timing .....	E-3
J-1	IBM Proprinter mode self test .....	J-3

# Tables

3-1	SelecType modes .....	3-3
5-1	Summary of FX-286 pitches .....	5-7
5-2	International characters in Epson NLQ mode ....	5-15
5-3	International characters in Epson draft mode ....	5-15
5-4	International characters in Epson draft italic mode	5-15
5-5	Maximum right margin settings .....	5-17
6-1	Graphics modes .....	6-9
A-1	DIP switch functions .....	A-4
A-2	International DIP switch settings .....	A-5
E-1	Pins and signals .....	E-1
E-2	Printing enabled/disabled signals and control conditions .....	E-4

# Introduction

The FX-286 printer combines the versatility and reliability of previous FX printers with a wide range of exciting new features.

- The Near Letter Quality typestyle or draft mode can be selected with the touch of a button—there are no codes to learn.
- For even greater typestyle variety, there's SelecType, a feature that works with almost all applications programs and can be set with the touch of a button to choose over two dozen different styles.
- When using an IBM PC or compatible, you can set the FX-286 to print in either the Epson mode or the IBM Proprinter mode. One setting gives you all the Epson commands and the Epson character set, the other gives you the IBM Proprinter commands and character set.
- An 8K buffer quickly frees your computer so you can work on one document while printing another.
- And, of course, the FX-286 also has the many features that have made previous FX printers so popular, including a fast print speed of 200 characters per second, both friction- and tractor-feed paper loading, and Master Select for instant access to a variety of typestyles.

## Using this manual

To make it easier to set up your new FX-286, this manual includes a ten-step guide to setting up your printer. These steps take you from unpacking, through ribbon and paper loading, to printing your first document.

Easy-to-read tabs make it simple to find information, for beginners or experienced users. Additional sections provide information on using your new printer with word processors, creating graphics, defining your own characters, and more.

# Chapter 1

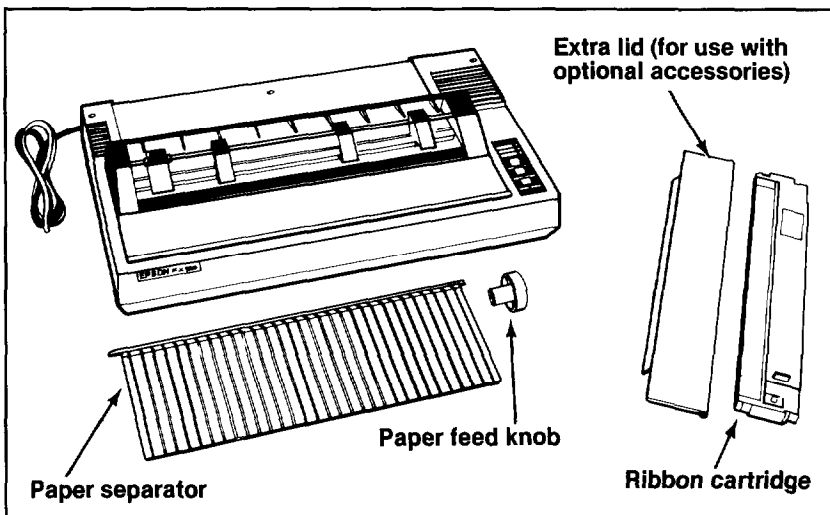
## Setting Up the FX-286

Setting up your new FX-286 is easy. Follow the steps in this chapter to ensure that your FX-286 is properly unpacked, located, and ready for operation.

### 1 Unpacking Your Printer

Be careful when unpacking your printer to make sure that you don't lose any necessary pieces.

First, remove the printer from the box and take off all outside plastic coverings and foam packing supports. Check that you've received all the parts shown in Figure 1-1.



*Figure 1-1. Printer parts*

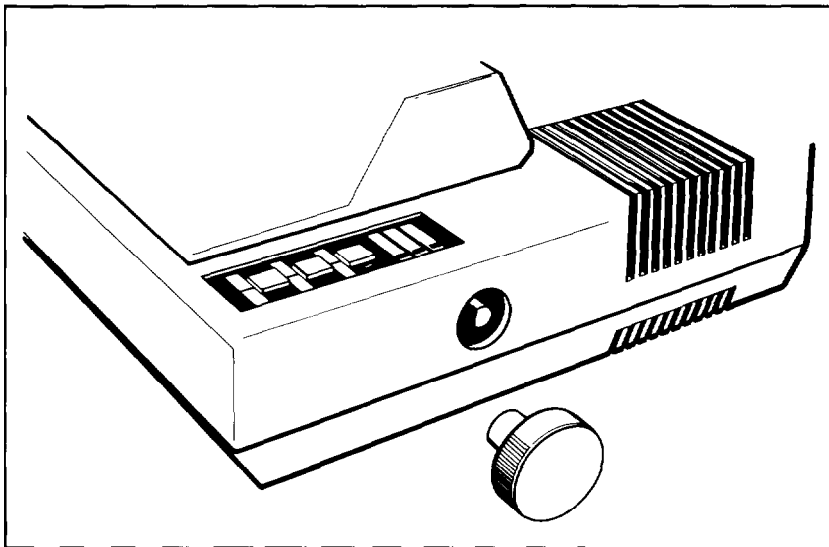
Once you've confirmed that you've received all the necessary parts, remove the sheet of paper wrapped around the printer's platen (the black roller). This sheet of paper protects the paper-out sensor during shipping, so be sure to replace it if you ship or store your printer.

Tilt the dust cover up and remove the two foam pads on the underside of the cover. (The pads protect the pin-feed holders on the tractor unit during shipping, so be sure to save them.)

There is also a clear plastic overlay on the control panel to protect against scratching and discoloration. It's up to you whether you want to remove the overlay or leave it on.

### **Installing the paper feed knob**

Before proceeding, you should install the paper feed knob. To install the knob, simply push it onto the shaft on the right side of the printer, as shown in Figure 1-2. The shaft has one flat side that must be matched with the flat side of the hole in the knob.



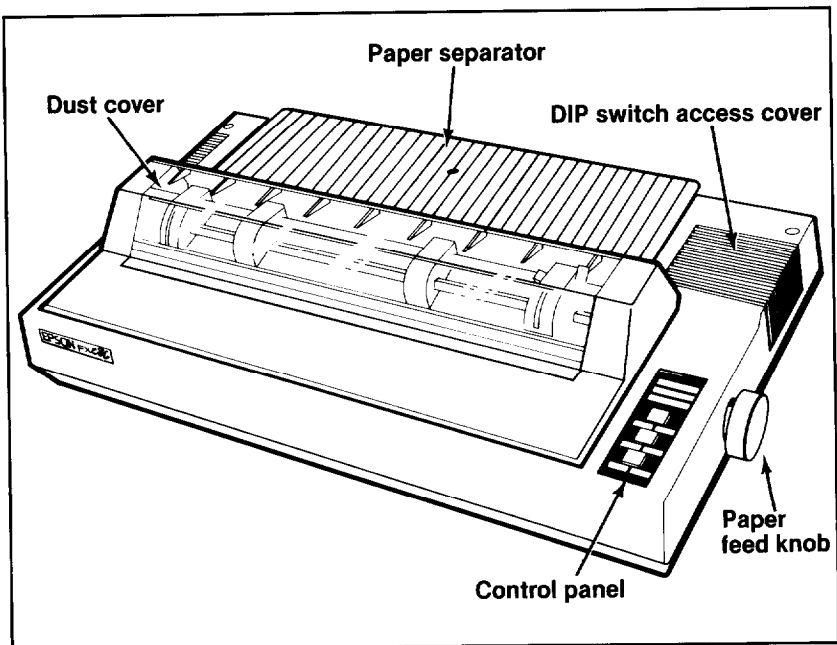
*Figure 1-2. Installing the paper feed knob*

## **2 Selecting the Right Location**

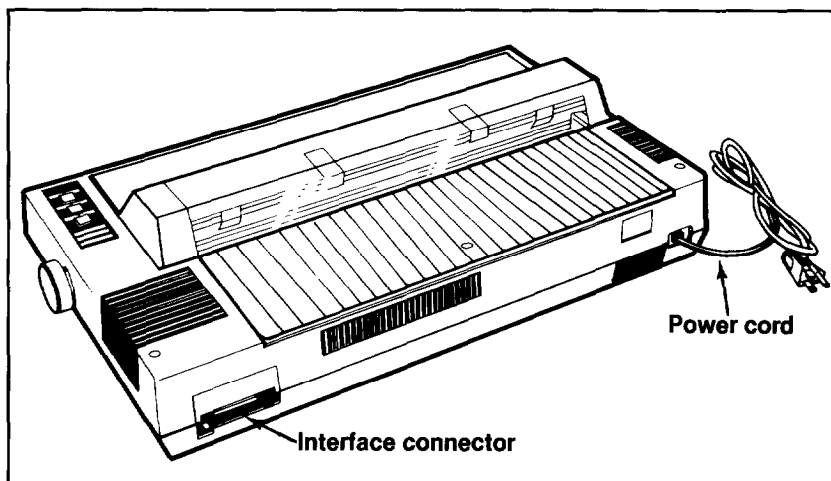
The most important consideration in choosing a location for your printer is that it be close enough to connect a cable to your computer. But also keep the following tips in mind:

- Place the printer on a solid foundation. Avoid setting it on carpet, chairs, or unstable surfaces.
- Use a grounded outlet; don't use an adapter plug.
- Avoid using electrical outlets that are controlled by wall switches—if you accidentally turn off a switch, you could wipe out valuable information and stop your printing.
- Keep your printer and computer away from base units for cordless telephones.
- Avoid using an outlet on the same circuit breaker with large electrical machines or appliances that might disrupt the flow of power to your printer.
- Protect your printer from direct sunlight, and keep it away from excessive heat, moisture, and dust. Make sure it's not too close to a heater or other heat source.

Once you've found a suitable location, look over the following illustrations to familiarize yourself with the FX-286.



**Figure 1-3. Front view of FX-286**



*Figure 1-4. Rear view of FX-286*

### 3 Installing the Ribbon

Before installing the ribbon and loading the paper, you should remove the dust cover to allow easier access to the printer. The next time you install a ribbon or load paper, you can leave the cover on.

To remove the dust cover, tilt it up and hold it by the left and right corners. Pull up on the left corner and the cover comes off the printer. (Only the left side of the cover is slotted where it attaches to the mounting pins on the printer case.)

Now you're ready to install the ribbon,

1. Manually move the print head to the middle of the platen.

---

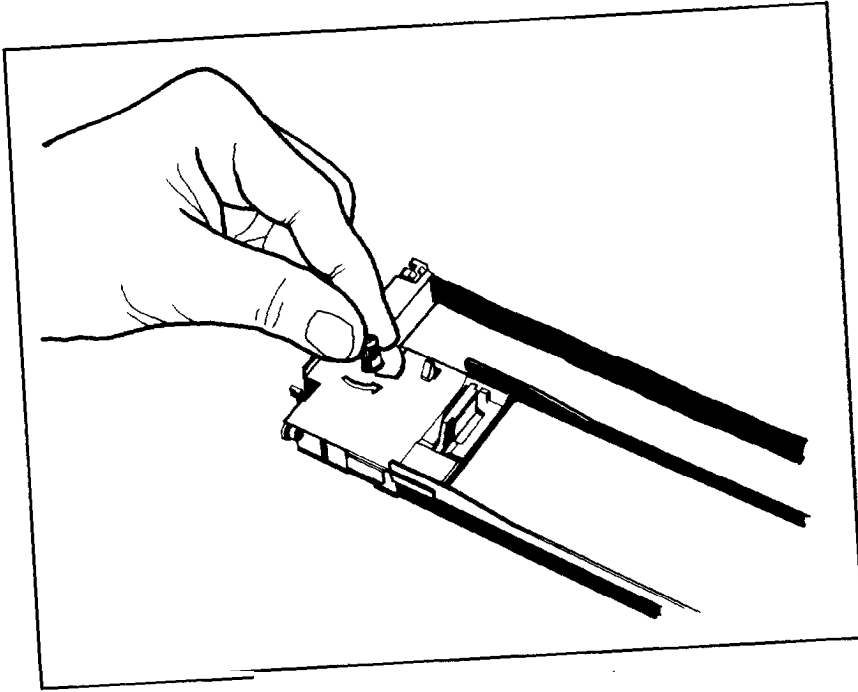
#### WARNING

**The power must be OFF when moving the print head. Moving the print head when the power is ON may damage your printer. If you've been using your printer just before changing the ribbon cartridge, be careful not to touch the print head because it becomes hot during use.**

---

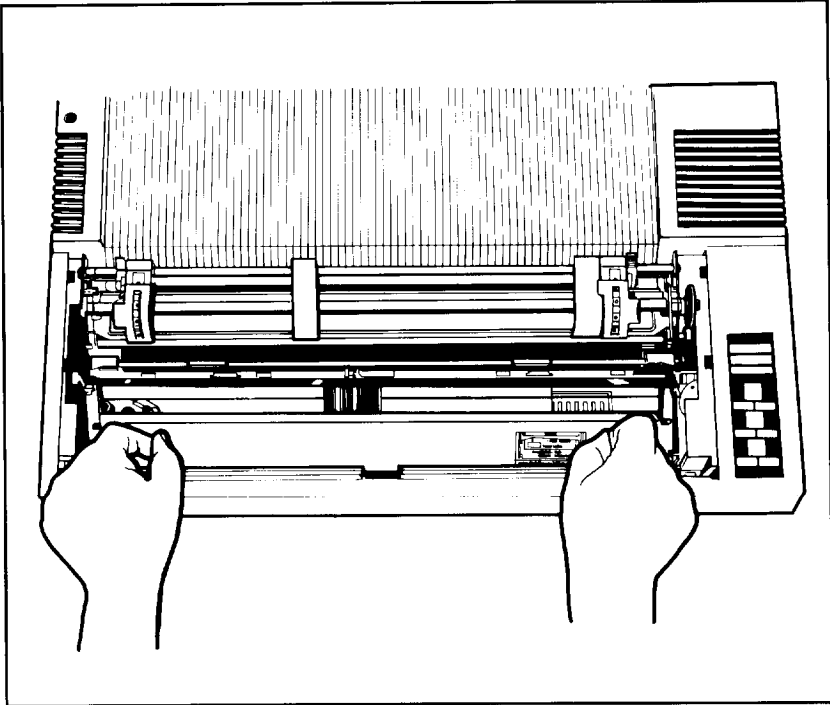


2. Before loading the cartridge into the printer, turn the small knob on top in the direction of the arrow to tighten the ribbon as shown in Figure 1-5.



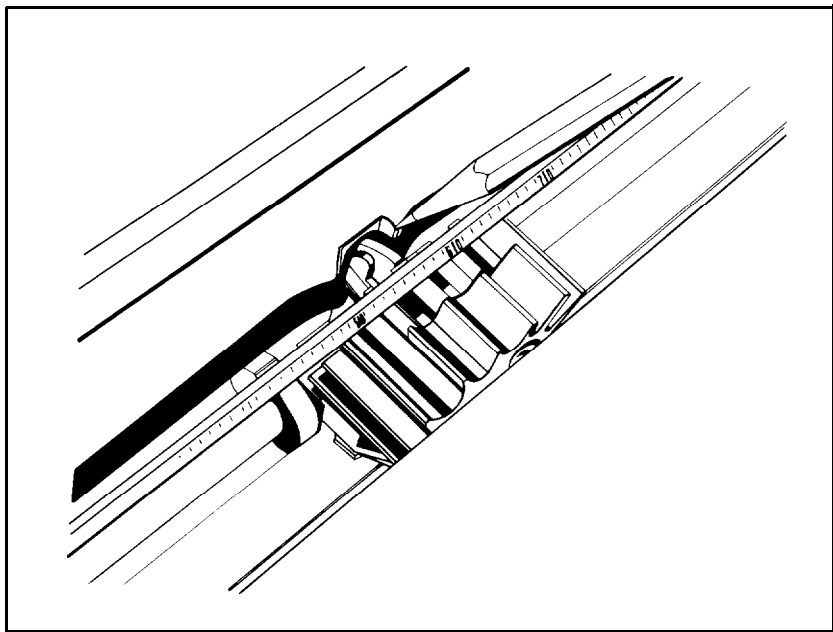
*Figure 1-5. Tightening the ribbon*

3. Hold the ribbon cartridge by the two plastic tabs on top of the cartridge case. Lower the cartridge into the printer, guiding the two square pins on each end of the cartridge into the slots in the printer frame, as shown in Figure 1-6. Press firmly on each end of the cartridge to make sure the pins are firmly seated in the slots.



***Figure 1-6. Loading the ribbon cartridge***

4. The ribbon should slide between the silver ribbon guide and the print head. If it doesn't, you can guide the ribbon into place using the point of a pencil, as shown in Figure 1-7. (You can also refer to the diagram on the top of the ribbon cartridge.)



**Figure 1-7. Positioning the ribbon**

5. With the cartridge in place, again turn the ribbon knob in the direction of the arrow to tighten the ribbon.

And that's it-the ribbon is now installed.

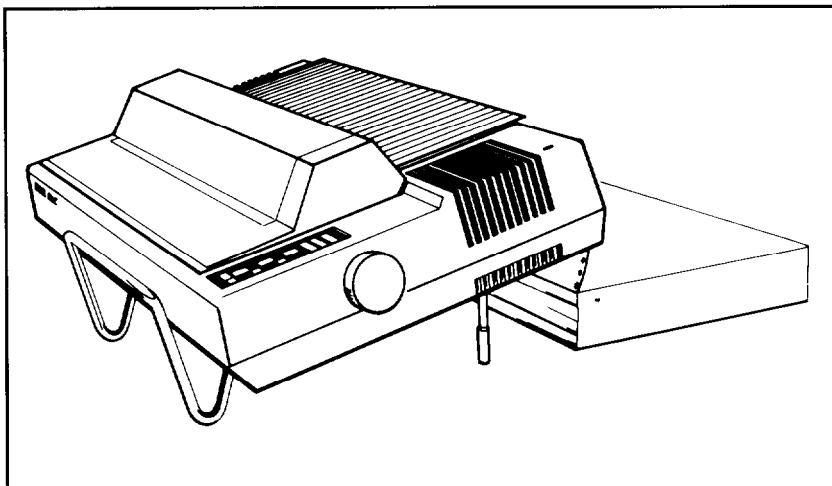
### **Replacing the ribbon...**

The FX-286 uses a continuous-loop, inked fabric ribbon. When printing becomes too light, you'll need to replace the ribbon with a fresh cartridge. To replace the ribbon, just pull up on the two plastic tabs on top of the cartridge and lift the cartridge out of the printer. To install a new ribbon, follow the preceding steps.

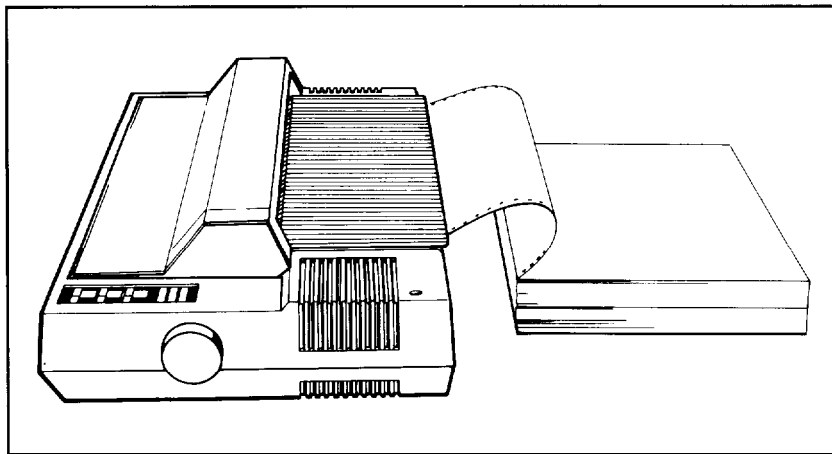
## **4 Loading Continuous-feed Paper**

If you plan to use the installed tractor feed unit and continuous-feed paper, set up your FX-286 where the paper can flow freely in and out of the printer.

There are many types of printer stands you can use, such as the one shown in Figure 1-8. Or you can use any other arrangement that allows you to put the paper underneath or behind the printer. If you prefer, you can stack the paper behind the printer as shown in Figure 1-9.



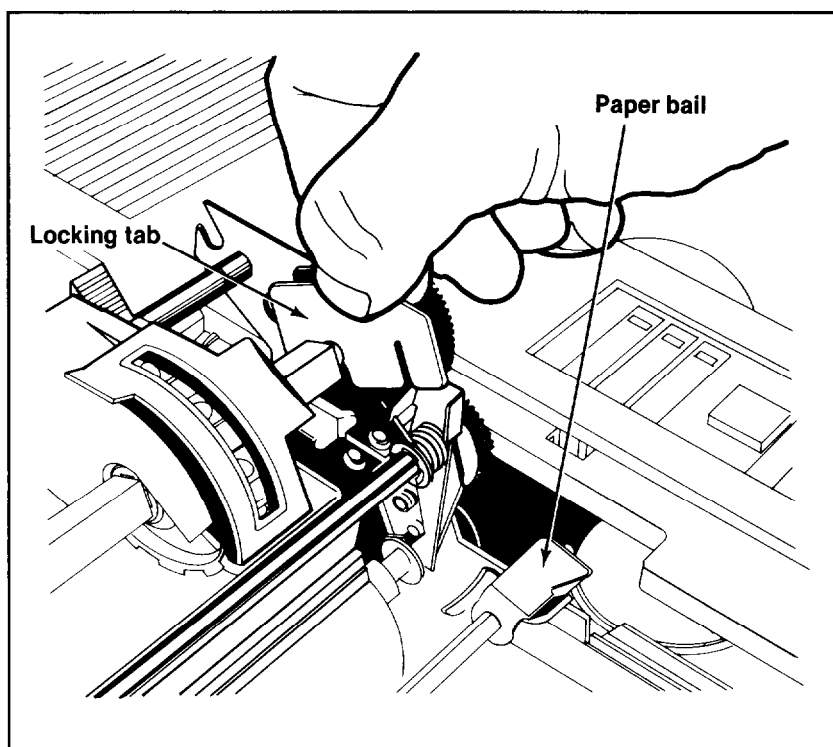
***Figure 1-8. Continuous-feed paper with printer stand***



***Figure 1-9. Continuous-feed paper without stand***

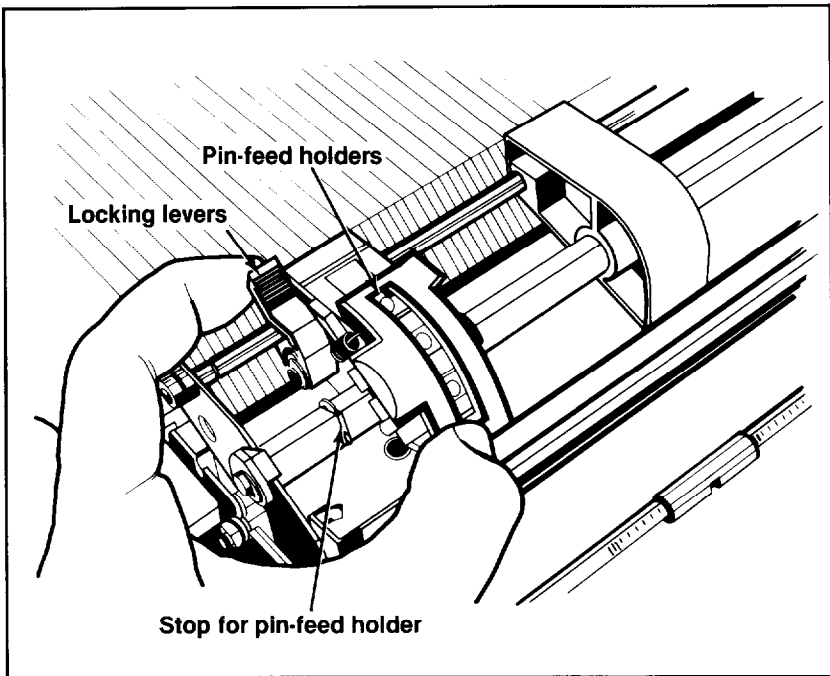
The tractor unit is adjustable to accommodate paper widths from 4 to 14 7/8 inches. To load continuous-feed paper, follow these instructions:

1. Make sure **that** the printer is turned OFF.
2. Move the print head to **the** center of the printer and pull the paper bail away from the platen.
3. Remove **the** two plastic locking tabs **that** secure the tractor feed unit during shipping, as shown in Figure 1-10. (If you **have** difficulty pulling the tabs off, a pair of pliers might help.) Keep the tabs in case you need to ship or store the printer.



**Figure 1-10. Removing the locking tabs from the tractor unit**

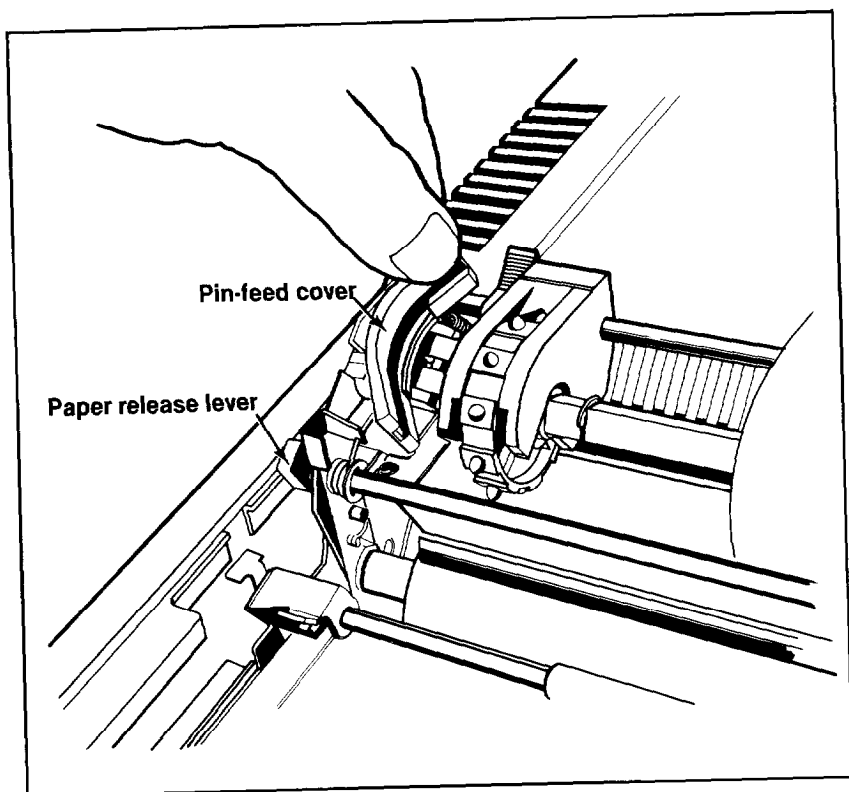
4. Using Figure 1-11 as a guide, pull the locking levers on the pin-feed holders forward so that you **can move** the holders to the left and right.



***Figure 1-11, Moving the pin-feed holders***

5. Position the left holder midway between the two stops on the tractor bar (see Figure 1-11) and push the locking lever back to lock that holder in place. Leave the right holder unlocked.

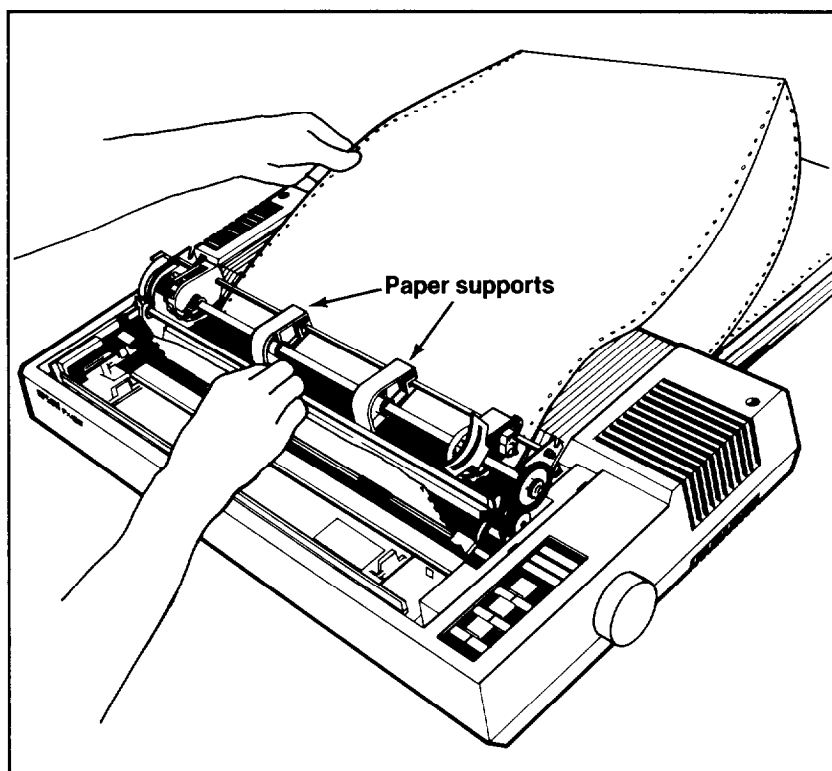
6. Open the pin-feed covers and pull the paper release lever forward as shown in Figure 1-12.



**Figure 1-12. Opening the pin-feed covers and paper release lever**

7. Guide the paper into the paper slot, and push it through until it comes up between the ribbon guide and the platen. (Moving the paper with a side-to-side motion makes it easier to push the paper through.)

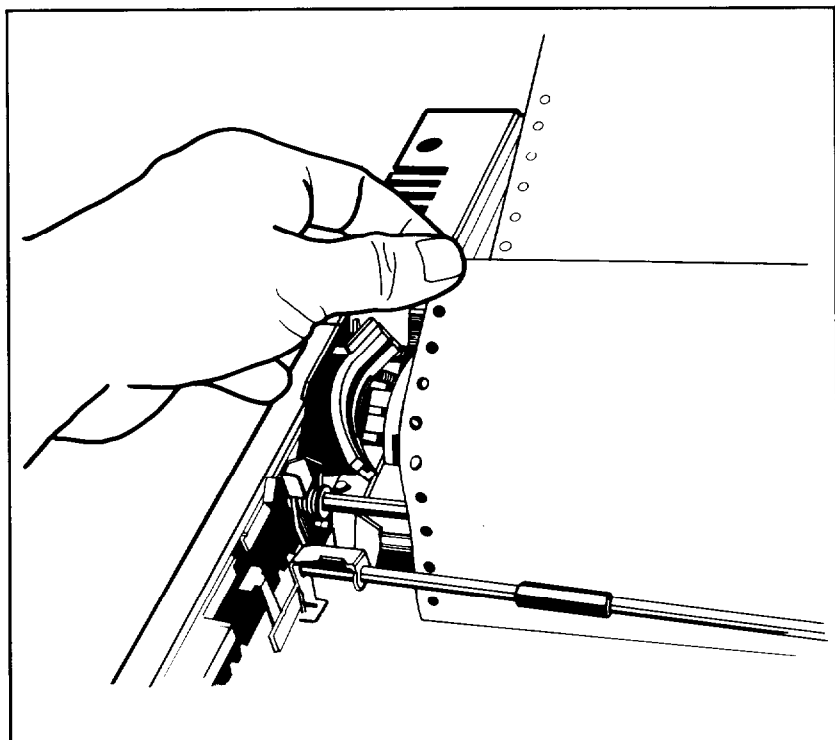
8. Slide the two paper supports on the tractor unit, spacing them evenly along the width of the paper as shown in Figure 1-13.



***Figure 1-13 Adjusting the paper supports; loading paper***

9. Pull the paper up until the top is above the pin-feed holders. Fit the holes on the left side of the paper over the pins in the left holder and close the cover.





**Figure 1-14. Fitting the paper *over the pin* feeds**

10. Fit the right side of the paper into the right holder, moving the holder as needed to match the width of the paper.
11. Close the right cover, making sure the paper has no dips or wrinkles and lock the right holder in place.
12. Line up the two pressure rollers on the paper bail with the paper supports (together they provide an even pressure for paper feeding). Push the paper bail against the paper and that's it ... the paper is ready.

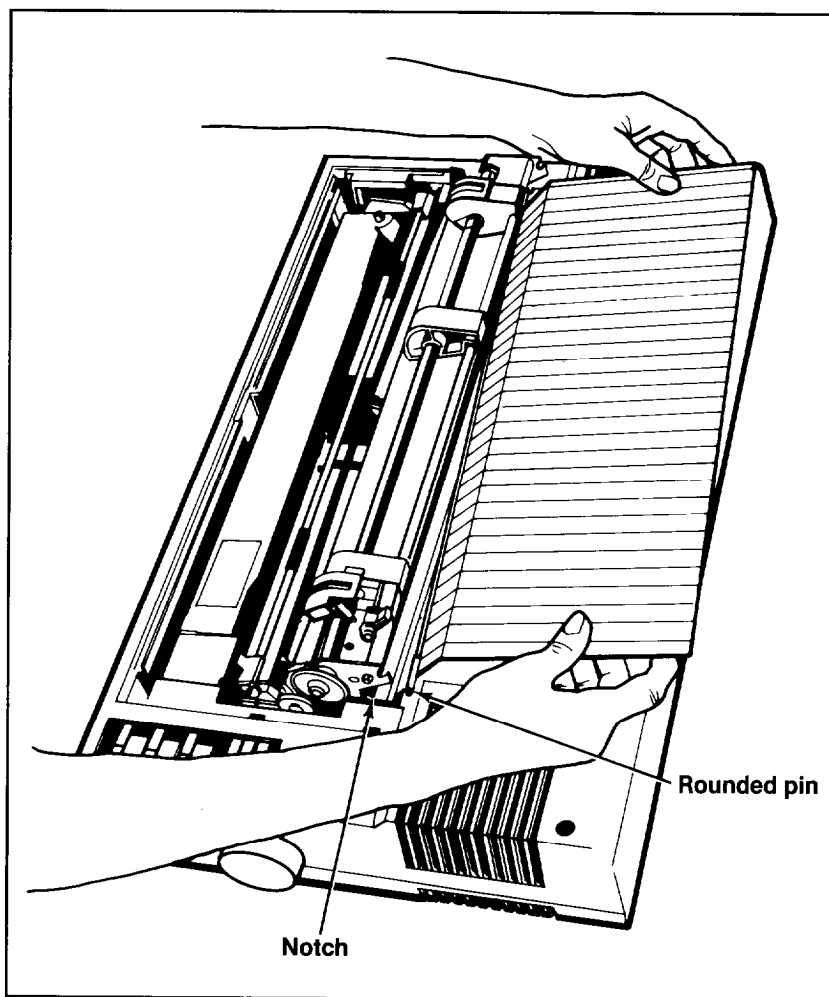
### Loading single-sheet paper...

The FX-286 can also accommodate single-sheet paper. It can be loaded manually as shown in Appendix B or by using the optional cut sheet feeder. Appendix B also contains information on how to remove and reinstall the tractor feed unit. The extra cover that comes packaged with the FX-286 is for use with single-sheet paper or the optional cut sheet feeder.

## Installing the paper separator

Once you've loaded paper into the FX-286 and are familiar with the steps, you **can** attach the plastic paper separator that comes packaged in the cardboard enclosure. The separator ensures that the paper coming out of the printer is not pulled back in.

The separator has rounded pins on **each** end that fit into notches located just behind the tractor feed unit. Slide one of the separator's pins into one notch, then with a gentle pressure, snap the other pin into the other notch as shown in Figure 1-15.



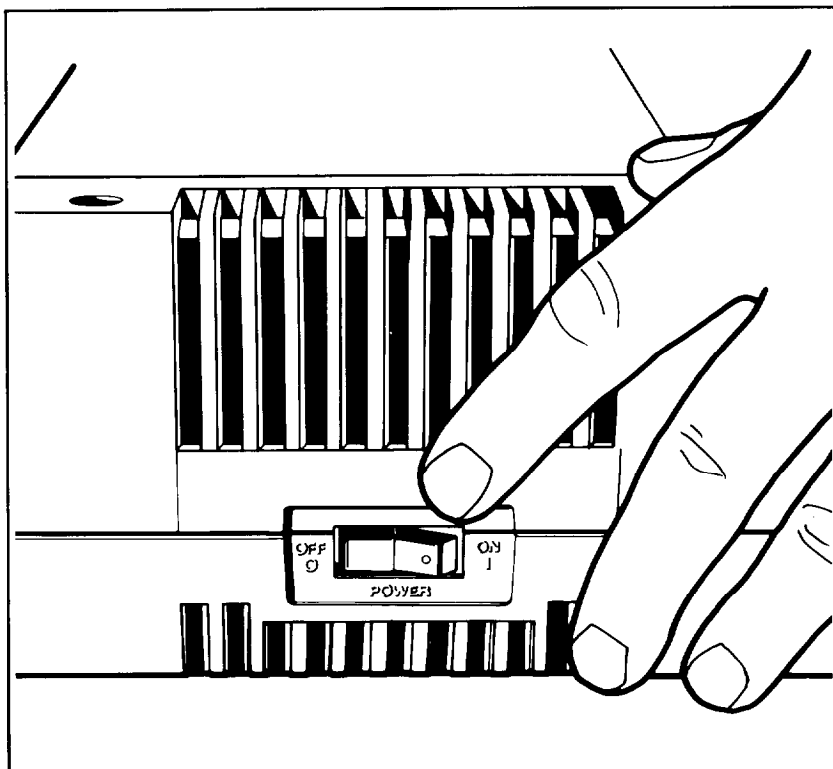
**Figure 1-15. Installing the paper separator**

## 5 Turning the Power On

With the ribbon and paper installed in the FX-286, it's time to turn the printer on and become acquainted with the power-up sequence.

Plug in the printer's power cord, making sure the outlet is properly grounded.

Turn the power ON with the switch on the left side of the printer (see Figure 1-16).



**Figure 1-16. Turning on the power switch**

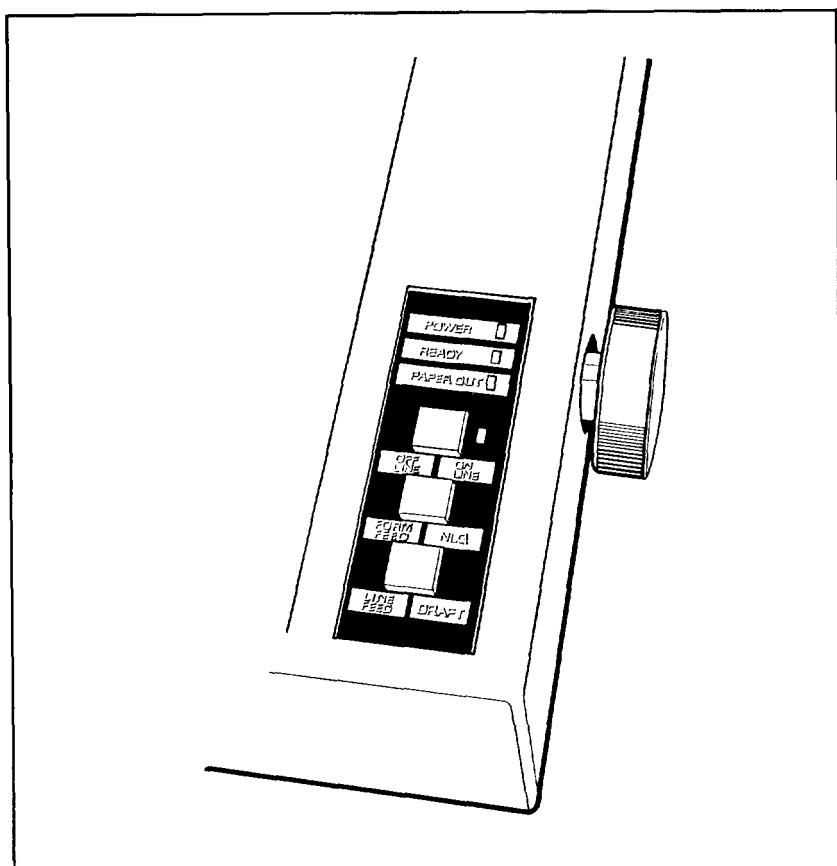
When the power is turned ON:

- The print head moves back and forth and stops at the left side of the printer.
- The printer is **initialized-any** previous settings are erased, and the printer is reset to its **default** (or preset) values (see Appendix A for default settings).

- The three green lights on the control panel-POWER, READY, and ON LINE-go on. (The red PAPER OUT light does not go on unless the printer is out of paper.)

## 6 Operating the Control Panel

Each of the three buttons on the FX-286 control panel (see Figure 1-17) has two functions-the functions marked on the blue panels (ON LINE, NLQ, and DRAFT) are active when the printer is on *line*; the functions marked on the yellow panels (OFF LINE, FORM FEED, and LINE FEED) are active when the printer is off *line*.



**Figure 1-17.** The FX-286 control panel

## OFF LINE/ON LINE

**OFF LINE**--If you press the ON LINE button when the green light above it is on, the ON LINE and READY lights go off and the printer is set off line--the power is still on but the FX-286 won't print. The FORM FEED and LINE FEED functions work only when the printer is off line.

**ON LINE**--The green ON LINE light indicates that the printer is **on line** and ready to receive data. If the READY light is also on, the FX-286 is ready to print (if it's connected to a computer). You may notice that the READY light flickers when the FX-286 is printing, but this is normal. When the FX-286 is on line, you can select either NLQ (Near Letter Quality) or draft modes.

## FORM FEED/NLQ

**FORM FEED**--Pressing the FORM FEED button advances the paper to the top of the next page if you're using continuous-feed paper (see Step 7, "Setting the Top-of-Page Position"). If you're using single-sheet paper, it fully ejects one sheet. The FORM FEED function works only when the printer is off line.

**NLQ (Near Letter Quality)**--Pressing the NLQ button selects the Near Letter Quality typestyle (for more information on NLQ; see the shaded box). The printer beeps twice to acknowledge the NLQ selection. You can select the NLQ typestyle with the NLQ button only when the printer is on line.

## LINE FEED/DRAFT

**LINE FEED**--Pressing the LINE FEED button advances the paper one line at a time, either while you're loading paper, or when you're adjusting where you want printing to begin. If you hold the LINE FEED button down, the paper advances continuously. The LINE FEED function works only when the printer is off line.

**DRAFT**--Pressing the DRAFT button selects the draft typestyle. The printer beeps once to acknowledge the draft selection. The draft mode is also the default setting for the FX-286, so every time you turn the printer on, it's set to print in the draft mode. The DRAFT button works only when the printer is on line.

## The NLQ mode...

In addition to the draft mode, the FX-286 has a high-quality NLQ (Near Letter Quality) mode. As explained in Chapter 4, dot-matrix characters are made up of many tiny dots. The NLQ characters are more fully formed than the draft ones because they are made up of more dots. You can see the difference in the printouts below.

### Epson Mode

**This** is printed in draft mode .  
This is printed in NLQ mode.

### IBM Proprinter Mode

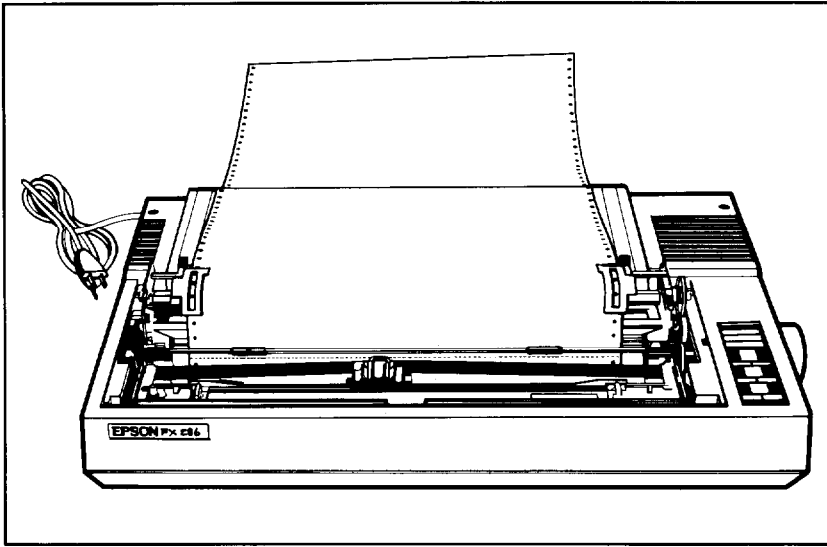
**This is printed in draft mode .**  
This is printed in NLQ mode.

The increased number of dots does slow the printing somewhat. Therefore, the FX-286 lets you choose high speed or high quality each time you print. You can print your ordinary work or preliminary drafts quickly in the draft mode and use the NLQ -mode for final copies or special purposes.

The panel buttons make it especially easy to change from draft to NLQ, but you can also select and cancel the NLQ mode with a software command (see Chapter 5). The following functions are not available in the Epson NLQ mode: italic, condensed, double-strike, elite, and proportional. Italic, condensed, and double-strike are not available in the IBM Proprinter NLQ mode. (Proportional is not available at all in the IBM mode.)

## 7 Setting the Top-of-Page Position

Once you've loaded continuous-feed paper into your FX-286 and turned the power on, you need to establish a top-of-page position so that the printed pages end where you want them to and do not cross over a perforation between pages.



**Figure 1-18. Top-of-page position**

To set the top-of-page position, use the LINE FEED function to advance the paper until a perforation between sheets lines up evenly with the top of the ribbon guide, as shown in Figure 1-18.

Now turn the printer OFF, then back ON. This reinitializes the printer and records this top-of-page setting. The printer remembers this setting and uses it when any program tells it to move to the top of the next page, or when you use the FORM FEED button to advance the paper.

If you are using a word processor or other applications program and the printing is too high or too low on the page, adjust your top-of-page setting accordingly.

### **Adjusting the paper-thickness lever**

The FX-286 is equipped with a paper-thickness lever that can be adjusted to accommodate varying thicknesses of paper.

The lever is located in front of the paper release lever on the left side of the printer as shown in Figure 1-19.

When you receive your FX-286, the lever is set for standard paper thickness (about 1/500th of an inch). For thicker paper or multiple copies, pull it toward the front of the printer (“+”). To return the lever to the standard position, see Figure 1-19.

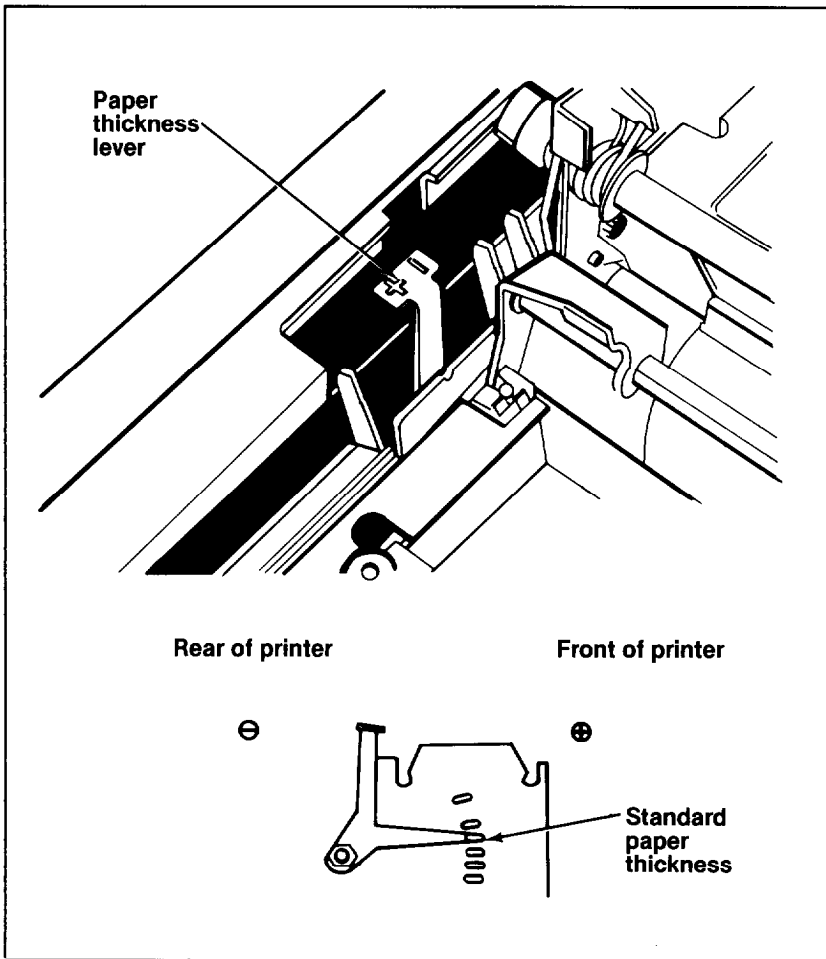
---

### Caution

Never use the extreme rear "—" setting. This position is used for head alignment and will shorten print head life if used in normal operation.

---

You've completed the setup and paper loading steps and **have** made the necessary adjustments-the FX-286 is ready to print. You can now replace the dust cover and tilt it down into its operational position.



**Figure 1-19. Paper-thickness lever**



## 8 Running the Self Test

The FX-286 has a built-in self test function that automatically prints out all of the characters in the printer's character set, even if it's not connected to a computer.

Before running the self test, load 8½ x 14-inch-wide paper into the printer, because the self test uses the full 14-inch measure to print out the characters. Align the left edge of the paper with the first black mark on the paper bail-this will ensure that the self test stays on the paper and doesn't run onto the platen.

---

### Note

If you've already loaded narrower paper, such as 8½ x 11, then you should replace it with wider 14-inch paper before running the self test. For information on loading single-sheet paper, see Appendix B.

---

With the power OFF, hold down the DRAFT button while you turn the power switch ON-the self test takes over and the FX-286 starts printing out the full character set in draft mode (see Figure 1-20) .

The self test continues until you shut the power OFF or the paper-out sensor is triggered. To print the self test in the NLQ mode, press the NLQ button when you switch the power ON (see Figure 1-20). To perform the self test in the IBM Proprinter mode see Appendix A.

```

Draft
/0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ
123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ
23456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[
3456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[
456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]

NLQ
3456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[ \
456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[ \1
56789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[ \]^
6789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[ \]^_
789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[ \]^_`
89:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[ \]^_`a

```

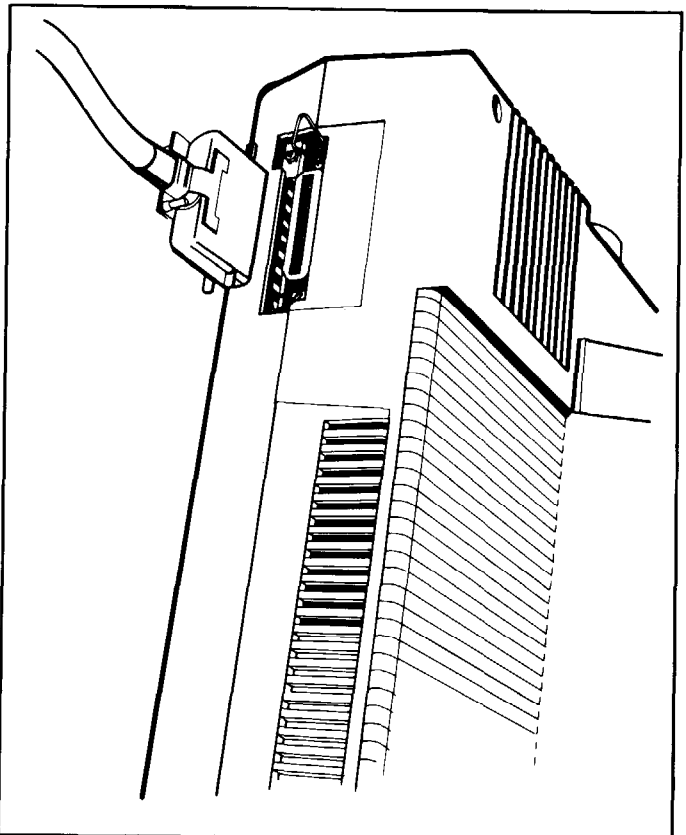
**Figure 1-20. FX-286 self test in Epson draft and NLQ modes**

## 9 Connecting Your Printer to Your Computer

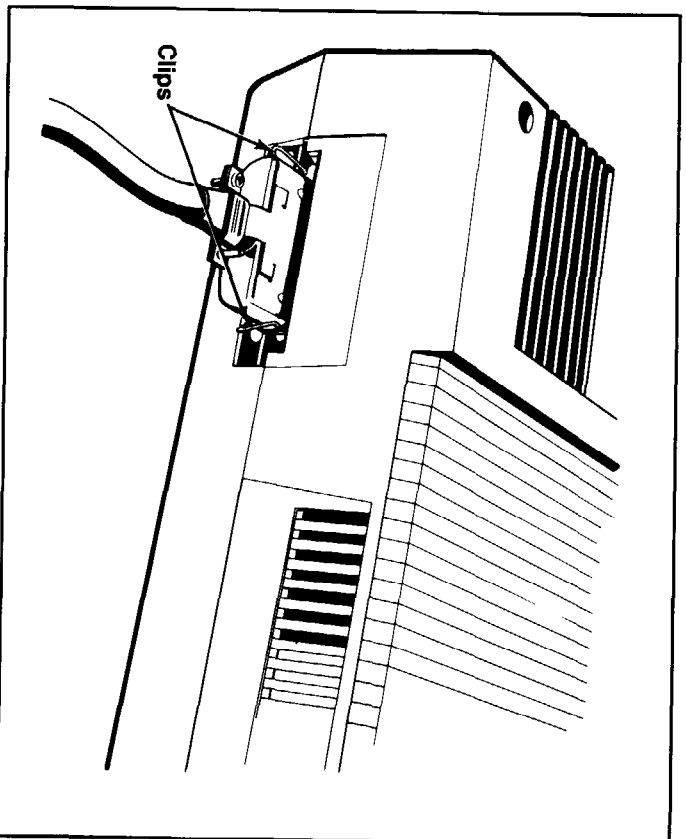
Your FX-286 communicates with your computer through a parallel interface cable. If your computer requires a different type of interface, such as a serial interface, see your Epson dealer.

The connector on a parallel interface cable, as shown in Figure 1-21a, is secured to both the FX-286 and your computer by two clips. After plugging the cable into the FX-286 and your computer, be sure to snap the clips in place and connect the ground strap if the cable is equipped with one.

Additional information on the interface is available in Appendix E.



*Figure 1-21a. Connecting a parallel interface cable*



*Figure 1-21b. Connecting a parallel interface cable*

# 10 Printing Your First Document

Now that you've completed the basic setup and operating steps, your FX-286 is ready to print.

The following chapter explains how to set up your word processor to work with the FX-286. Using a word processor is probably the easiest way to print; it will also give you a chance get acquainted with the FX-286 and its many features.

Additional chapters and appendixes cover programming, control codes and ESCape sequences, technical specifications and maintenance .

If you're using an IBM PC or compatible, you can use either the Epson mode or the IBM Proprinter mode.

For the Epson mode, simply use the printer selection routine on your software program to choose "FX-286," or one of the alternate choices given in the following chapter. The Epson command set allows you to take full advantage of all of the FX-286's features and capabilities. The FX-286 is already set in the Epson mode from the factory, so there are no DIP switches to change. Refer to Appendixes G, H, and I for additional information on the Epson mode.

If you wish to use the IBM Proprinter mode, use the printer selection routine on your software program to choose "IBM Proprinter," or one of the alternate choices given in the following chapter. Then change three DIP switches as described in Appendix A. However, the Proprinter command set is limited compared to the Epson set, so you will not be able to take advantage of many of the features of the FX-286, including italic and proportional printing. Refer to Chapter 5 and Appendixes J and K for additional information on the IBM Proprinter mode.

## Chapter 2

# Using the FX-286 with Commercial Software

You've now completed setting up your new FX-286 printer and the self test has confirmed that the printer is operating correctly. You're ready to print your first document.

Although you could use BASIC or another language for your first effort, a word processor will probably make things easier, and also give you a chance to explore the capabilities of the FX-286 printer.

### Using the FX-286 with Word Processors

Most word processing programs support the Epson FX printers because of their widespread use and standardized print codes.

To use the FX-286 with most word processing programs, all you have to do is to tell the program that you are using an Epson FX printer. When you do this, the word processing program automatically sends the correct information to the printer. This process is normally part of the *setup* or *installation* process.

Many word processors have special utility programs for different printers, called *printer drivers*. This is usually a short question-and-answer session in which the program asks two or three basic questions. To set up a program for use with the FX-286, give the following answers.

Question	Answer
What computer are you using?	The name of your computer
What printer are you using?	FX-286 (see following paragraph for additional explanation)
What type of interface are you using?	Parallel or serial, depending on your cable and computer

If your word processor doesn't list the FX-286, don't worry. The FX-286 recognizes the same codes as earlier models in the FX series, so you can choose any FX model that's listed. Some programs simply list "Epson Printer," or "Standard" or "Draft" printer-these choices will also work, because all Epson dot-matrix printers recognize a standard set of printer codes.

Once you've made your selection, the program remembers the type of printer you're using every time you want to print and sends the appropriate codes.

These are general guidelines to help you get started with your FX-286. The process is different for each word processing program, but the specific information can be found in your word processor's manual. Consult the sections on printers, printing text, print functions, print devices, and printer drivers for further information.

## **The IBM Proprinter mode**

The FX-286 can also reproduce the IBM Proprinter character sets if you reset three DIP switches (see Appendix A). Remember, however, that when you reset the FX-286 for the IBM Proprinter mode, you will lose some of the capabilities available in the Epson mode.

When you reset the FX-286 for the IBM Proprinter mode, you need to change the printer driver on your word processor or applications program. Your first choice should be "IBM Proprinter" (model 4201) if it's listed. If the Proprinter isn't listed, look for "IBM Parallel Printer," "IBM Graphics Printer," or just "IBM Printer"-any of these choices should work when the FX-286 is in the IBM Proprinter mode.

Remember, when you switch your printer in and out of the IBM Proprinter mode, you must change the DIP switches on the FX-286, and change the selected printer if you're using an applications program. For further information on the Proprinter IBM mode, see Chapter 5.

## **Using the FX-286 with Other Applications Programs**

You can also use the FX-286 to print other documents, such as spreadsheets, with various commercial software packages.

Although word processors are often designed to provide a variety of type enhancements (such as condensed, double-width, etc.), many spreadsheets or other programs are more limited in what they offer.

When using these other programs, keep in mind that the FX-286 has its own set of additional typesyles with the SelecType function (see Chapter 3). For example, you may have a spreadsheet program that allows you to print only in standard draft mode, with a maximum of 136 columns. However, if you use the Selec Type function to put your FX-286 in the condensed mode, you can fit 233 columns in the same space.

As with word processors, most of your printing will be straightforward. If your program has a printer selection routine, follow the advice given in the word processing section.





## Chapter 3

### SelecType

The FX-286's SelecType feature can produce nine special typestyles and skip-over-perforation. The typestyles are:

**This** is condensed mode

T h i s i s d o u b l e - w i d t h

**This** is elite mode

**This is emphasized mode**

*This is italic type*

This is double-strike mode

**This is under line mode**

This superscript

This subscript

### SelecType Operation

Using SelecType is easy. You turn on SelecType and select a typestyle, then turn off SelecType and print.

---

#### Note

For convenience, this chapter uses the yellow label names of the buttons-OFF LINE, FORM FEED, and LINE FEED.

---

#### Turning SelecType on

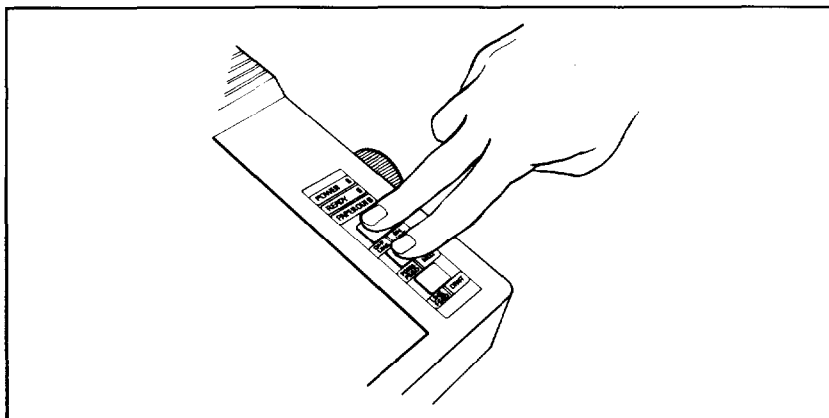
1. Make sure that the printer is on and that the POWER, READY, and ON LINE lights are all on.
2. Press both the OFF LINE and FORM FEED buttons **at the same time**, as illustrated in Figure 3-1. Hold them down for at least a second, then release them.

---

### Note

If the printer beeps twice before you release the buttons, you have pressed the FORM FEED button before the OFF LINE button instead of at the same time and FX-286 is in the NLQ mode. Press the OFF LINE button to put the printer back on line and press the DRAFT button if you do not want NLQ. Then press both the OFF LINE and FORM FEED buttons to turn on SelecType.

---



**Figure 3-1. Turning SelecType on**

When you release the OFF LINE and FORM FEED buttons, the FX-286 signals in three ways that SelecType is on.

- The printer beeps.
- The READY light turns off.
- The ON LINE light begins flashing.

### Selecting typestyles

In SelecType, each button has a function:

- OFF LINE selects typestyles.
- FORM FEED sets the styles.
- LINE FEED turns SelecType off.

After turning on SelecType, follow these three steps to select a typestyle:

1. Find the typestyle you **want** in Table 3-1.

**Table 3-1. SelecType modes**

<b>Mode</b>	<b>Typestyle or Function</b>
1 Condensed	<b>This is condensed</b> mode
2 Double-width	<b>T h i s d o u b l e - w i d t h</b>
3 Elite	This is elite mode
4 Emphasized	This is emphasized <b>mode</b>
5 Italic	<b>This is italic type</b>
6 Double-strike*	This double-strike mode
7 Underline	This is under line mode
8 Superscript	This is superscript
9 Subscript	This is subscript
10 Skip-over-perforation	

\*Sets NLQ in IBM Proprinter mode.

2. Press the OFF LINE button the number of times indicated in the mode column. Be sure that the printer beeps each time you press the OFF LINE button.
3. Press the FORM FEED button to set the typestyle.
4. Press the LINE FEED button to turn SelecType off. The control panel returns to its normal functions, but the printer is off line.
5. Press the OFF LINE button, and you are ready to print.

### **SelecType exercise**

You don't need to know anything about programming for this exercise because it is merely for practice. If you would rather not use BASIC, use your word processing or business program to create a short file or document of the type you will usually print.

If you do want to use BASIC for this exercise, simply turn on your computer and printer and load BASIC. Then type the short program listed below. Only the words inside the quotation marks are printed. You can put anything you want there. (If your version of BASIC does not use LPRINT consult your BASIC manual.)

```
10 LPRINT "This is an example"  
20 LPRINT "of FX-286 printing."
```

Now, run the program by typing RUN and pressing RETURN, or print your file or document by following the printing instructions of your software. The FX-286 prints your example in standard single-strike printing, as shown below:

## This is an example of FX-286 printing.

Now that you have created a sample, follow these steps to print it in double-width mode:

1. See that both the ON LINE and READY lights are on.
2. Press the OFF LINE and FORM FEED buttons at the same time, then release them. You hear a beep to signal that SelecType is on.
3. As shown in Table 3-1, the code for double-width is two. Therefore, press the OFF LINE button two times. (Remember to make sure you hear a beep each time you press the OFF LINE button when you are in SelecType mode.)
4. Now that you have *selected* the double-width mode, push the FORM FEED button once to set it.
5. Push the LINE FEED button once to return the panel to its standard operation.
6. Press the OFF LINE button so the FX-286 is ready to print.

Now you have set the FX-286 to print in double-width mode. Print your sample once more. It should appear in double-width mode just as you see below:

T h i s   i s   a n   e x a m p l e  
o f   F X - 2 8 6   p r i n t i n g .

Turn off your printer to cancel the double-width setting, and-if you wish-try this exercise with other modes.

---

## Note

Some applications programs are designed to control all typestyle functions. These programs cancel all previous typestyle settings by sending a signal (INIT) before printing. Because this signal cancels SelecType settings, you will have to use the program's print options function instead of SelecType to select your typestyles. Therefore, if SelecType does not work with a particular applications program, consult its manual on how to select typestyles.

---

## Mode combination

Two of the SelecType modes (double-width and emphasized) can be combined to create an impressive effect. If you want to see this combination, turn your printer OFF and back ON and follow the instructions below:

1. See that the ON LINE and READY lights are on.
2. Press the OFF LINE and FORM FEED buttons at the same time.
3. Press the OFF LINE button twice and then the FORM FEED button once.

Since two is the code for double-width, you have now set the FX-286 for double-width.

4. Press the OFF LINE button two more times and then the FORM FEED button once again.

This makes a total of four times, and thus sets the FX-286 for emphasized also.

5. Press the LINE FEED button to return the panel to its standard operation.
6. Press the OFF LINE button to put the FX-286 on line.

Now print your sample document or run your sample program. Your printing should appear in double-width emphasized as you see here:

T h i s i s a n e x a m p l e  
o f F X - 2 8 6 p r i n t i n g .

If you get any other results, turn your printer off and back on and then try the steps again.

## Skip-over-perforation

If you are using continuous-feed paper for printing program listings or other material not controlled by an applications program, you may find that the FX-286 prints right over the perforations between pages. SelecType has a function to prevent this: skip-over-perforation.

If you press OFF LINE ten times, the FX-286 skips six lines after each 60 lines that it prints. Since a standard page is 66 lines, this gives you one inch of blank space at the bottom of each page. If you prefer to have half of the blank space at the top of the page and half at the bottom, simply set your top-of-page approximately one-half inch below the perforation. (See Step 7 in Chapter 1 if you need to refresh your memory on setting top-of-page.)

## SelecType Tips

Once you have learned the simple technique for controlling print styles with SelecType, you can use it whenever you wish. You should be aware of a few restrictions, however.

- SelecType is designed to control the printing of an entire file or document, not an individual line or word.
- If you are using the NLQ mode, remember that the following SelecType modes are not available in NLQ: italic, condensed, double-strike, and elite.
- Emphasized can't combine with condensed or elite.
- Because a character cannot be in subscript and superscript at the same time, these two modes obviously cannot be combined. If you set both superscript and subscript, the FX-286 will use the last one set.
- If you wish to cancel SelecType functions, see "Cancelling Unwanted Functions with SelecType" in Appendix C.

Don't worry about harming your printer if you try to combine two modes that the FX-286 can't mix. Your settings cannot damage the printer. If it receives codes for two modes that it can't combine, it uses only one of them.

Although there are restrictions on combining some other modes, underline and double-width can combine with any mode.

Double-width mode doubles the width of each character. Therefore, be sure that each line you print in the double-width mode is less than half a page wide or this mode will spoil your margins and the appearance of your page.

If there are print codes in the document or file you are printing, those codes will override your SelecType settings. This seldom happens, since you usually won't use SelecType with files that have such codes, but if your FX-286 follows the SelecType instructions for only part of a document, print codes in the document may conflict with the SelecType modes.

After you turn on a mode with SelecType, it stays in effect until the printer is turned off. If, for example, you use SelecType to print a document in emphasized, anything you print after that will be emphasized unless you first turn the printer off and back on.

For more information on the FX-286 typesyles, see Chapter 5.





# Chapter 4

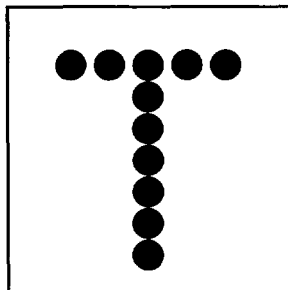
## Elements of Dot-Matrix Printing and Computer/Printer Communications

This chapter is for those of you who want to know something about how your printer works. It's a simple, non-technical explanation of the basics of dot-matrix printing that will help you understand some of the later chapters, particularly the ones on graphics and user-defined characters.

### The Print Head

The FX-286 uses a print head with nine pins or wires mounted vertically. Each time a pin is fired, it strikes the inked ribbon and presses it against the paper to produce a dot. This dot is about 1/72nd of an inch in diameter. The size varies slightly depending upon the age of the ribbon and the type of paper used. As the head moves horizontally across the page, these pins are fired time after time in different patterns to produce letters, numbers, symbols, or graphics.

For example, to print a pica capital T, the head fires the top pin, moves 1/60th of an inch, fires the top pin again, moves 1/60th of an inch, fires the top pin and the six below it at the same time, moves 1/60th of an inch, fires the top pin, moves another 1/60th of an inch, and fires the top pin once more to finish the letter. All this happens in only 1/160th of a second.

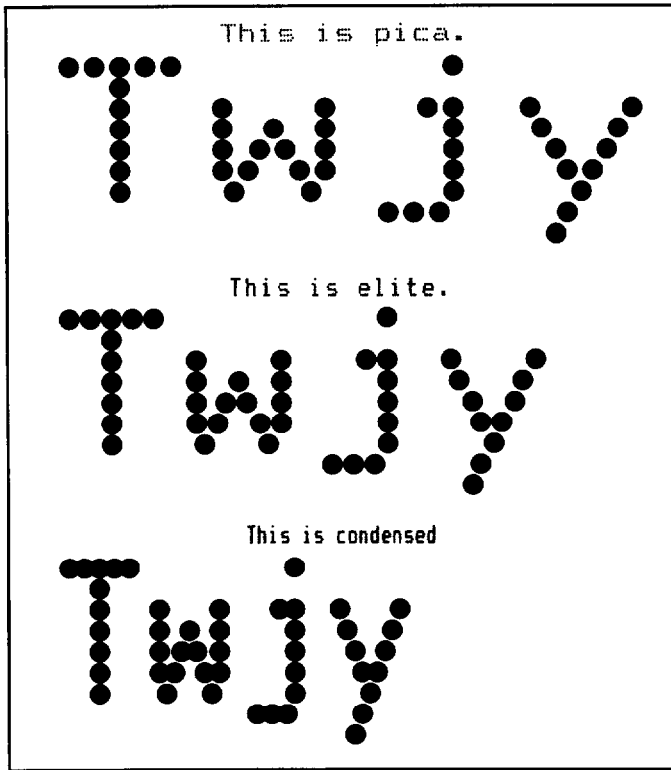


**Figure 4-1. A capital T**

## Changing Widths

In addition to pica, in which there are 10 characters per inch, the FX-286 can also print in other widths. It does so by reducing the distance between pin firings. In the elite mode it prints 12 characters per inch and in the condensed mode it prints slightly more than 17 characters per inch. The pattern of the dots is not changed, but the horizontal space between them is reduced.

Figure 4-2 shows enlargements of four sample letters in each of the three widths. These letters are chosen to show how the FX-286 prints letters that are uppercase and lowercase, with and without descenders (the bottom dots of the j and y), and wide and narrow.



**Figure 4-2. The three widths of the FX-286**

The dot pattern of each character is carefully designed so that in pica no dot overlaps another. The reason is that in normal high-speed printing the pins cannot fire, retract and fire again quickly enough to print one dot overlapping another.

## Computer-to-Printer Communications

A computer and printer communicate by means of numbered codes. If you press the letter A on the keyboard, it is translated into a numeric code, transmitted to a peripheral device (such as a video screen or a printer) then converted back into the letter A.

To cope with the many different kinds of computer and printers used today, a standard set of codes has been developed. This set of codes is called the American Standard Code for Information Interchange, or ASCII (pronounced ASK-KEY) for short. Almost all computers use these ASCII codes to communicate with printers.

There are ASCII codes for all of the letters in the alphabet, both upper- and lowercase, and for the numbers from 0 to 9. The ASCII code also includes most punctuation marks, and some codes that control printer functions. If you refer to the ASCII chart in Appendix I, you'll find that all of these letters, numbers and punctuation marks have been assigned code numbers from 32 through 255.

### ASCII Codes

Although these codes are standard from computer to computer, they can be expressed in a number of different ways. The chart in Appendix I lists each ASCII code as a character (A, B, C, 1, 2, 3), as a decimal and as a hexadecimal number. For example, the letter A is represented as an A and as the decimal number 65. If you wanted to print the letter A using the BASIC language, you would use the decimal notation, written as CHR\$(65).

The chart also shows the **hexadecimal** (or hex) value of each character. The hexadecimal numbering system is based on units of 16; our usual numbering system, decimal, is based on units of 10. In hex, the letter A is expressed as 41H (the H stands for hexadecimal).

The ASCII codes are expressed in different ways to suit a variety of applications. For example, the decimal notation is usually used in BASIC programming, as illustrated earlier. However, some programmers prefer the hexadecimal system. Appendix I contains comparative tables showing the ASCII characters, along with their decimal and hexadecimal equivalents.

## Control Codes

Most of the time you don't give this code system a thought. If you press A on the keyboard, the computer sends the code to the printer and the letter A is printed. However, some printer codes, like the one for a vertical tab, do not have a key on the keyboard.

These are the ASCII codes with values of less than 32. These codes are called **control codes** because they control the operation of the printer. These characters are not displayed on your screen and aren't printed as a character by your printer.

## ESCAPE Sequences

There are not enough control codes for all the advanced features of modern printers, so multiple-code control sequences have been developed. All of these control sequences begin with the control code ASCII 27, which is called **escape**. These sequences can have more than one code following Escape, depending on the command. (In this manual, ESCape is written as ESCape or ESC, depending on whether it's being used in a sentence or as a control code. You might also see it written as (ESC) in other manuals.)

The ESCape code changes the interpretation of the codes that follow it—they are interpreted as part of a printer command. For example, if the FX-286 receives the decimal code 52, it prints the numeral 4 because 52 is the ASCII code for that number. If, however, the printer receives a 27 just before the 52, it turns on the italic mode, because ESCape "4" is the FX-286's code for italic printing.

This same command could also be written with the "4" in place of the 52. As noted at the beginning of Appendixes G and J, many ESCape sequences can use letters or numbers enclosed in quotation marks. These letters or numbers can be used in place of the decimal or hexadecimal values as long as they're placed in quotes. There's no functional difference between the two systems, but you might find the letters and numbers easier to remember.

## Demonstration Programs

To help you understand control codes and ESCape sequences and to enable you to see the FX-286 features in action, this manual includes demonstrations in the BASIC programming language. Although you

will probably not do much of your printing using BASIC, the demonstrations are in BASIC because nearly all personal computer users have some version of this language. Therefore, almost everyone can try the examples.

As you run the programs (or even as you read the explanations and look at the printed examples), you learn how the FX-286 responds to the messages your computer sends it by printing letters, numbers, symbols, and graphics in various print modes.


Even if you never use BASIC again, you will know the capabilities of your printer, capabilities that can often solve your printing problems. For example, if you need a special symbol, such as the scientific symbol for one of the planets, you will know that you can turn to the chapter on user-defined characters and create such a character.

If you don't want to do **the** exercises in BASIC, you don't have to. In most cases the software that you use for word processing, business, or graphics does the calculating and communicating with the printer for you. All you need to do is install your software as explained in Chapter 2.

## Running BASIC Programs

This section describes how to run the BASIC demonstration programs in this manual; it is not a tutorial in BASIC programming.

Although there are many versions of BASIC, the programs in this manual are designed to work with the two most popular ones: Microsoft™ BASIC and IBM PC BASIC. If you have another version, you can run these demonstration programs by making a few changes. Appendix D has instructions for using Applesoft™ BASIC; for other versions of BASIC, consult the appropriate manual.

When you type these programs, be sure to include all spaces and punctuation marks, especially semicolons. Press RETURN at the end of each line. (On your computer the RETURN key may be marked  or ENTER.) Computers that use a 40-column display may break some lines into two parts on the screen, but that does not affect the operation of the program. If you make a typing mistake, retype the whole line, including the line number; the new line will replace the old one.

When you have typed all the lines, type RUN and press RETURN to run the program.

If you have made changes to a program and want to see all of it on the screen, type LIST and then press RETURN to see the program on your screen. When you are completely through with one program and want to start another, type NEW and press RETURN.

## How to Send Control Codes to the Printer

The short program, that follows illustrates the concepts of control codes and ESCape sequences. This exercise may help you make better use of the next three chapters. Type and run the program. It should produce the printout you see below it. After the printout is a detailed description of the operation of the program.

```
10 LPRINT "BASIC programs for the"
20 LPRINT CHR$(70)CHR$(88)CHR$(45)CHR$(50)CHR$(56)CHR$(54)
30 LPRINT CHR$(&H46)CHR$(&H58)CHR$(&H2D)CHR$(&H32)CHR$(&H38)CHR$(&H36)
40 LPRINT "W1 "CHR$(87)CHR$(49)
50 LPRINT CHR$(27)"W1";"Double-width print"
60 LPRINT "Still double-width"
```

```
BASIC programs for the
FX-286
FX-286
W1 W1
D o u b l e - w i d t h   p r i n t
S t i l l   d o u b l e - w i d t h
```

In each line LPRINT signals that the rest of the information on the line is to be sent to the printer. In line 10 the letters inside the quotation marks are printed just as they appear in the program.

Line 20 shows an alternate way of printing characters. It uses the CHR\$(character string) function with the decimal code for each letter. Line 30 uses the same method except that it uses hexadecimal numbers instead of decimal numbers. (The symbols &H before each number are required to signal that the numbers are hex, not decimal.)

Line 40 prints the characters **W1** using the two different methods (quotation marks and the character string function). Line 50 shows that if the ESCape code, which is CHR\$(27) in BASIC, comes before the characters **W1**, those characters are not printed. Instead, they

become part of the ESCape sequence that turns on double-width printing, which is demonstrated with the letters in quotation marks after the ESCape sequence. Line 60 shows that the double-width mode stays on for more than one line.

This program is only an introduction. The next three chapters have more demonstration programs that allow you to see the features of your FX-286 in action.





## Chapter 5

### **FX-286 Features**

This chapter describes many of the printing features of the FX-286. You can read this chapter if you wish, but you may not need to. Whether or not you use the rest of this manual depends upon your expertise, your interest, and the software you use.

#### **IBM Proprinter Mode**

In addition to all the standard Epson features, the FX-286 has an IBM Proprinter mode. If you have an IBM PC or compatible and want to use the IBM Proprinter mode, turn it on by resetting three DIP switches inside your printer (see Appendix A).

When you have selected the IBM Proprinter mode, your printer is changed in two ways: It uses an IBM character set and it uses a somewhat different set of control codes.

There are actually three different character sets in the IBM Proprinter mode: Standard, Alternate, and All Print. All three sets are available in draft and NLQ. Printouts of the three sets appear at the end of Appendix K.

The Standard and Alternate character sets can be selected by changing a DIP switch, as explained in Appendix A. The third character set, All Print, can only be selected with ESCape code "`\`" or "`^`". See the detailed explanations of these codes in Appendix J for additional information.



## Pica Printing

The first exercise is a simple three-line program to print a sample line of characters in pica, the standard width. Enter this program:

```
40 FOR X=65 TO 105
50 LPRINT CHR$(X);
60 NEXT X: LPRINT: LPRINT
```

Now run the program. You should get the results you see below, 10 pica characters per inch.

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_ 'abcdefghi
```

## Changing Widths

Now you can try other widths. As explained in Chapter 4, the FX-286 uses the same pattern of dots for pica, elite, and condensed characters, but it changes the horizontal spaces between the dots to produce the three different widths.

In elite mode there are 12 characters per inch, and in condensed there are 17.16. The FX-286 prints in elite when it receives the ESCape "WI" command (Escape ":" in Proprinter mode) and prints in condensed when it receives the ASCII 15 command. Print a sample line of elite characters by adding the following line to your previous program. (Simply type this line and press RETURN; you do not need to retype the other lines.)

```
20 LPRINT CHR$(27)"M";
or
20 LPRINT CHR$(27)": ";
```

This line uses the command for elite, ESCape "M" (or ":"), to turn on that mode. When you run the program, your printout should look like the one below.

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_ 'abcdefghi
```

The net addition to the program cancels elite with ESCape "P" (ASCII 18 in Proprinter mode) and turns on condensed with ASCII 15:

```
30 LPRINT CHR$(27)"P"CHR$(15);  
or  
30 LPRINT CHR$(18)CHR$(15);
```

Now run the program to see the line printed in condensed mode.

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi
```

## Cancelling Codes

As you saw in the third version of the print width program, you must cancel a code when you don't want it any more. With very few exceptions, the FX-286 modes stay on until they are cancelled. It is important to remember this because an FX-286 mode can stay on even if you change from BASIC to another type of software. For example, if you run the above program and print a memo with a word processing program afterward, the memo is printed in condensed because the printer is still in condensed mode. To cancel condensed, use ASCII 18. In BASIC, you use this format:

```
LPRINT CHR$(18)
```

To avoid having one program interfere with the printing modes of another, you can cancel a mode one of two ways:

- With a specific cancelling code such as ASCII 18 to cancel condensed. Each mode has a cancelling code, which you can find in the discussion of the code and in Appendixes G and J. Pica is an exception to this rule. To cancel pica, turn on elite or condensed.
- By resetting the printer, a method explained in the next section.

## Resetting the Printer

Resetting your FX-286 cancels all modes that are turned on. You can reset the printer with one of two methods:

- In the Epson mode only, by sending the reset code (Escape "@" )
- Turning the printer off and then on.

Either one of these methods returns the printer to what are called its defaults, which are the standard settings in effect every time you turn the printer on. Resetting the printer has two main effects: It returns the printing to single-strike pica, thus cancelling any other modes or enhancements you may have turned on, and the current position of the print head becomes the top-of-page setting. The reset code does not affect SelecType settings, and does not cancel NLQ if it has been selected with the panel button, but turning off the printer does cancel SelecType and NLQ settings.

## **Disabling a program's reset code**

Many word processors and applications programs send a reset code or initialization signal to the printer before sending data to be printed.

Basically, the purpose of this code or signal is to reset the printer to its default settings and wipe out any other settings that might exist. The programs do this to ensure that the printing comes out as expected, without being influenced by unknown settings.

In most instances, this is fine. However, if you decide you want to set up the FX-286 to do something your applications program won't do, you have to make sure a reset code doesn't wipe out your new settings.

Many initialization codes can be disabled by using the setup or installation procedures that are part of many applications programs. Once you're into the setup procedure, find the section that deals with initialization, and see if the program has a list of codes it sends to the printer. If it does, the setup procedure usually allows you to cancel or remove the initialization settings.

If the initialization code cannot be disabled or removed from your applications program, you can usually use the program's print options function to control formatting and typestyles. Look in the manual for the program to find out how to select print options.

## **Width Comparison**

Now that you have used three short programs to produce samples of the three main widths, you can choose the width that you prefer or the one that best fits a particular printing job. Most people use either pica or elite for printing text and condensed for spreadsheets or other applications in which it is important to get the maximum number of characters on a line.

In fact, for even more characters than the 233 per line that condensed gives you, elite and condensed can be combined for a mode called condensed elite (in the Epson mode only). It is not really another width, because the size of the characters is the same as in the condensed mode; only the space between the characters is reduced. You can see this mode, which allows 272 characters to fit on a line, if you replace line 30 in your last program to produce the following program:

```
20 LPRINT CHR$(27)"M";
30 LPRINT CHR$(15);
40 FOR X=65 TO 105
50 LPRINT CHR$(X);
60 NEXT X: LPRINT
```

With this addition, the program turns on condensed but doesn't turn off elite, giving you the printout below:

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\^_`abcdefghijkl
```

## Near Letter Quality Mode

The examples so far in this chapter are in the draft mode, but you can also use a software command rather than the FORM FEED/NLQ button to turn on the NLQ mode.

Enter and run the following program to see how the NLQ mode is turned on by an ESCape sequence in Epson mode (Escape "x1") or Proprietary mode (Escape "12"). (Note that you use a lowercase x, not a capital X, in line 10).

```
NEW
10 LPRINT CHR$(27)"x"CHR$(1);
or
10 LPRINT CHR$(27)"I"CHR$(2)
20 FOR X=65 TO 105
30 LPRINT CHR$(X);
40 NEXT X: LPRINT
```

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\I^`abcdefghijkl
```

The following modes and typestyles are available in NLQ:

<b>Epson Mode</b>	<b>IBM Proprinter Mode</b>
Double-width	Double-width
Emphasized	Elite
Superscript	Emphasized
Subscript	Superscript
Underline	Subscript
	Underline

All the modes demonstrated in this chapter are compared in Table 5-1.

Table S-7. Summary of Fx-286 *modes*

Print sample	CPI
← inch →	
Near Letter Quality	10.00
Pica print	10.00
Elite print	<b>12.00</b>
Condensed print	17.16
Condensed elite *	<b>20.00</b>

\*Epson mode only

Remember that you don't have to use BASIC to change modes; you can use any method or software that sends the proper codes to the printer.

### Print Enhancements and Special Characters

Besides the widths (pica, elite, and condensed) already covered, the FX-286 offers many other typestyles.

#### Emphasized mode

In the emphasized mode the FX-286 prints each dot twice, with the second dot slightly to the right of the first. In order to do this, the print head must slow down so that it has time to fire, retract, and fire the pins quickly enough to produce the overlapping dots. This method produces better-looking, more fully-formed characters that are darker than single-strike characters.

To see an example of emphasized, type and run the following program.

```
NEW
10 LPRINT "This is standard printing."
20 LPRINT CHR$(27)"E";
30 LPRINT "This is emphasized printing."
100 LPRINT CHR$(27)"F"
```

This is standard printing.  
**This is emphasized printing.**

In Epson mode, emphasized works only in draft pica and NLQ modes; in IBM Proprinter mode, it also works in elite.

You do sacrifice some print speed with emphasized, because the print head slows down and prints twice as many dots, but there is a noticeable improvement in print quality. You may want to use emphasized instead of the NLQ mode for some purposes because emphasized printing is faster than NLQ printing. The code to turn off emphasized is ESCape "F".

## Double-strike

The other bold mode is double-strike. For this mode the FX-286 prints each line, then moves the paper up slightly and prints the line again. Each dot is printed twice, with the second one slightly below the first as you can see if you run this program, which uses ESCape "G" to turn on double-strike. In the IBM Proprinter mode, ESCape "G" produces NLQ rather than double-strike when used with either the pica or elite widths. With all other modes and widths, ESCape "G" produces double-strike.

```
10 LPRINT "This is standard printing."
20 LPRINT CHR$(27)"G";
30 LPRINT "This is double-strike printing."
100 LPRINT CHR$(27)"H"
```

This is standard printing.  
This is double-strike printing.

Unlike emphasized, double-strike combines with many modes (but not with NLQ) because it does not overlap dots horizontally. Since



each line in this mode is printed twice, the speed of your printing is slowed. The code to turn off double-strike is ESCape "H".

Some users prefer the effect of emphasized, and others prefer double-strike. You can look at the printout below and decide for yourself.

```
This is standard printing.  
This is emphasized printing.  
This is double-strike printing.
```

## Double-width mode

Perhaps the most dramatic mode on the FX-286 is double-width. It produces extra-wide characters that are good for titles and headings. For this mode, the dot pattern of each character is double-width and twice as many dots are printed. You can see the difference between pica and double-width pica if you enter and run this program:

```
10 LPRINT "This is standard printing."  
20 LPRINT CHR$(27)"W1";  
30 LPRINT "This is double-width."  
100 LPRINT CHR$(27)"W0"
```

```
This is standard printing.  
T h i s   i s   d o u b l e - w i d t h .
```

For this mode the letter W and the numeral one together turn the mode on and the letter W and the numeral zero together turn it off. Thus ESCape "W1" turns on double-width and ESCape "W0" turns it off.

Those of you who are programmers may be interested in another form of double-width. In this alternate form, called one-line double-width, the printing is the same as that in the example but it is turned on by ASCII 14 and is turned off by a line feed, ASCII 20, or ESCape "W0".

## Mode combinations

You can also use control codes to combine modes. For example, you can make a title especially vivid by combining emphasized and double-width. In fact, you can combine many of the print modes on

the FX-286; your FX-286 printer can print such complicated combinations as double-strike emphasized double-width underlined subscript, although you may never want such a combination. The point is, however, that the FX-286 has the ability to produce almost any combination you can think of; it's up to you to decide which ones you want to use.

To see emphasized combined with double-width, change two lines in your previous program:

```
20 LPRINT CHR$(27)"W1"CHR$(27)"E";  
30 LPRINT "Emphasized double-width"
```

When you run the program, your printout should match the one below, showing that the two modes combine with no trouble.

This is standard printing.  
E m p h a s i z e d   d o u b l e - w i d t h

A later section in this chapter explains a special Epson mode ESCape code, Master Select, which allows you to control seven features with one ESCape sequence.

### Underline mode

The FX-286 also has a mode that will underline characters and spaces. You turn it on with ESCape "-1" and off with ESCape "-0". Note that the underline code is like the double-width code in that it uses a character, in this case the hyphen or minus sign, combined with the numeral one to turn it on and a character combined with the numeral zero to turn it off. You can see it in action with the following program:

```
NEW  
10 LPRINT "This text is not underlined."  
20 LPRINT CHR$(27)"-1";  
30 LPRINT "This text is underlined."
```

This text is not underlined.  
This text is underlined.

As shown in the printout above, the underline mode is continuous, but some word processing and other applications programs produce

an underline that leaves small gaps in the line as demonstrated in the printout below.

T h i s i s u n d e r l i n e c h a r a c t e r .

If your software prints this type of underline, it is using the FX-286's underline character (ASCII 95), not the underline mode. Because the underline character is only five dots wide, it does not fill the spaces between characters.

### **Proportional mode**

In pica draft mode on the FX-286, each character is given the same amount of space, whether it is a narrow letter like **i** or a wide letter like **w**. In the proportional mode, however, the space allowed for each letter is proportional to its size.

The proportional mode, which is available only in Epson mode draft pica, also prints all letters in emphasized. You can see the difference between standard and proportional modes if you enter and run the following program.

```
10 LPRINT CHR$(27)"p1"  
20 LPRINT "Proportional mode is on."  
30 LPRINT CHR$(27)"p0";  
40 LPRINT "Proportional mode is off."
```

**Proportional mode is on**  
Proportional mode is off

Notice that you must use a lowercase **p** for this mode. The next section describes Master Select, which includes another method for turning proportional on and off.

### **Master Select**

The FX-286 has a special Epson mode ESCape code called Master Select that allows you to choose any possible combination of seven different modes: pica, elite, proportional, condensed, emphasized, double-strike, double-width, italic, and underline. The format of the

Master Select code is ESCape "I" followed by a number that is calculated by adding together the values of the modes listed below:

underline	128
italic	64
double-width	32
double-strike	16
emphasized	8
condensed	4
proportional	2
elite	1
pica	0

For any combination, just add up the values of each of the modes you want and use the total as the number after ESCape "I". For example, to calculate the code for double-width underlined pica, add the following numbers together:

underline	128
double-width	32
pica	0
	160

To print this combination, therefore, you use ESCape "I" followed by the number 160. In the BASIC programming language the command is `CHR$(27)"I"CHR$(160)`.

To try this number or any other, enter and run this short program, which will ask you for a Master Select number and then give you a sample of printing using that code.

```
10 INPUT "Master Select number";M
20 LPRINT CHR$(27)"I"CHR$(M)
30 LPRINT "This sample of printing uses"
40 LPRINT "Master Select number";M
50 LPRINT CHR$(27)"@"
```

In this program, you can use any number you calculate by using the formula above, but remember that emphasized can't be combined with condensed or elite. If you try to combine emphasized with either of the two narrow widths, you won't harm your printer; it will simply use a priority list in its memory to determine which mode to use.

The printer's priority list causes a combination of emphasized and elite to produce elite only, a combination of emphasized and condensed to produce emphasized only, and a combination of all three to produce condensed elite. Also remember that elite or condensed will cancel pica.

Master Select is a powerful code that gives you an easy way to produce multiple combinations with a single command. To see double-strike emphasized underlined printing, for example, you need only one ESCape code instead of three.

Indeed, Master Select is such a powerful feature that it may occasionally be more powerful than you want it to be. Because it controls seven different modes, a Master Select code will cancel any of those seven that are not selected. For example, suppose that you have a page in elite and want part of it underlined. If you use ESCape "!" 128 to turn on underlining, your FX-286 will begin printing in underlined pica instead of underlined elite because the 128 code does not include elite. Use 129 for underlined elite.

## Superscript and subscript

Your FX-286 can also print superscripts and subscripts, which you can use for mathematical formulas, footnotes, and other items that require numbers or letters above or below the usual print line. ESCape "SO" turns on superscript and ESCape "S1" turns on subscript. ESCape "T" turns off either one. You can see them in action with the program below:

```
10 LPRINT "The formula for water is H";
20 LPRINT CHR$(27)"S1";"2"CHR$(27)"T";
30 LPRINT "0."
40 LPRINT CHR$(27)"T"
```

T h e f o r m u l a    f o r w a t e r i s H<sub>2</sub>O .

Now that you see how to use the ESCape sequences for superscript and subscript, you can devise your own examples.

## International characters

As you know, languages other than English require a few extra characters. In the Epson mode, the FX-286 has provided for printing in many languages by having nearly 100 international characters in its ROM (Read Only Memory). This total includes characters in three sets: draft, draft italic, and NLQ (Near Letter Quality).

In order to print any of these characters, you first select one of the following character sets and then use the individual characters within that set.

0 USA	6 Italy
1 France	7 Spain
2 Germany	8 Japan
3 United Kingdom	9 Norway
4 Denmark I	10 Denmark II
5 Sweden	

You select the character set in one of two ways: with an ESCape code or with a DIP switch (see Appendix A). The ESCape code in BASIC has the following format:

```
LPRINT CHR$(27)"R"CHR$(n)
```

in which n is the appropriate number from the list above. In other words, the BASIC command to select the French character set is

```
LPRINT CHR$(27)"R"CHR$(1)
```

The other method of selecting an international character set is to reset a DIP switch. If you plan to use one of the international sets quite a bit, see Appendix A for instructions for using the DIP switches.

Once you have selected a character set, whether you do it with the ESCape code or the DIP switches, you will be able to print several new characters. The character sets are shown in Tables 5-2, 5-3, and 5-4.

**Table 5-2. International characters in Epson NLQ mode**

	35	36	64	91	92	93	94	96	123	124	125	126
USA	#	\$	@	[	\	]	^	`	{		}	~
FRANCE	#	\$	à	°	ç	§	^	`	é	ù	è	~
GERMANY	#	\$	ß	À	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	\$	@	[	\	]	^	`	{		}	~
DENMARK I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	À	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	¢	\$	@	í	ñ	¿	^	`	~	ñ	}	~
JAPAN	#	\$	@	[	¥	]	^	`	{		}	~
NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

**Table 5-3. International characters in Epson draft mode**

	35	36	64	91	92	93	94	96	123	124	125	126
USA	#	\$	@	[	\	]	^	`	{		}	~
FRANCE	#	\$	à	°	ç	§	^	`	é	ù	è	~
GERMANY	#	\$	ß	À	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	\$	@	[	\	]	^	`	{		}	~
DENMARK I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	À	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	¢	\$	@	í	ñ	¿	^	`	~	ñ	}	~
JAPAN	#	\$	@	[	¥	]	^	`	{		}	~
NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

**Table 5-4. International characters in Epson draft italic mode**

	35	36	64	91	92	93	94	96	123	124	125	126
USA	#	\$	@	[	\	]	^	`	{	/	}	~
FRANCE	#	\$	à	°	ç	§	^	`	é	ù	è	~
GERMANY	#	\$	ß	À	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	\$	@	[	\	]	^	`	{	/	}	~
DENMARK I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	À	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	¢	\$	@	/	ñ	¿	^	`	~	ñ	}	~
JAPAN	#	\$	@	[	¥	]	^	`	{	/	}	~
NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

The number at the top of each column in the tables is the ASCII code that prints the characters in that column.





most are taken care of by applications programs. Instead, this section describes a few commands that the average user might need. For more information, see Appendixes G and J, where all the commands are listed and described.

## Margins

The FX-286 allows you to set the left and right margins with simple ESCape sequences. In the Epson mode, the left margin command is ESCape “1” followed by the number of the column you choose for the left margin. The right margin command is ESCape “Q” followed by the column number of the right margin you want. (For the left margin command, be sure to use a lowercase letter l, not the numeral one.)

If your word processing program does not allow you to change the margins, you can send margin commands to your FX-286 with BASIC or another programming language before you print your documents. For example, if you prefer wider margins than your word processing program gives you, run the following BASIC program before printing. This program gives you a left margin of 10 and a right margin of 60, but you can use any numbers you prefer for the margin commands.

```
NEW
10 LPRINT CHR$(27)"l"CHR$(10);
20 LPRINT CHR$(27)"Q"CHR$(60);
```

A program like this also allows you to choose the margins you prefer for program listings. Just remember that once you run a program that sets margins, those margins are in effect until you change them with new margin commands or turn off or reset the printer.

The maximum right margins are shown in Table 5-5.

Table 5-5. Maximum *right margin settings*

Normal	136
Elite	163
Condensed	233
Condensed Elite*	272

\*Epson mode only

The IBM Proprinter mode uses a different command to set margins. It is ESCape "X" followed by two numbers. The first number is the left margin and the second number is the right margin. In the IBM mode, the previous program would be written as follows:

```
NEW
10 LPRINT CHR$(27)"X"CHR$(10)CHR$(60)
```

Therefore, if you are using the IBM Proprinter mode, be sure to use the ESCape "X" command for margin settings.

## **Skip-over-perforation**

If you are using continuous-feed paper for printing program listings or other material not controlled by an applications program, you may find that the FX-286 prints right over the perforations between pages. The FX-286 has an ESCape code to prevent this: the ESCape "N" command. You send ESCape "N" followed by the number of lines you want the FX-286 to skip at the bottom of a page. For example, in BASIC the following line will make the FX-286 skip six lines after each 60 lines if your printer is set for 11-inch paper:

```
10 LPRINT CHR$(27)"N"CHR$(6);
```

Since an 11-inch page is 66 lines, this will give you one inch of blank space at the bottom of each page. If you prefer to have half of the blank space at the top of the page and half at the bottom, simply set the top of page approximately three lines (1/2 of an inch) below the perforation. (See Step 7 in Chapter 1 if you need to refresh your memory on setting the top-of-page.)

## **Line spacing**

Ordinarily you don't have to worry about how the printer moves the paper so that it doesn't print lines of text on top of each other; the FX-286 takes care of this without any special instructions. The line spacing on the FX-286, however, can be changed with an ESCape code.

The movement of the paper between lines is called a line feed and the distance the paper moves is called a line space. In ordinary printing the line spacing is 1/6 of an inch, which produces six lines of print per inch. The standard spacing is the same as 12 rows of dots. Since the FX-286 characters use nine rows of dots, the 12-dot line spacing leaves three blank rows between the lines of text.

The standard line spacing is the only one you need for almost all printing of text, but in some cases you may want to increase or decrease the space between lines. The FX-286 has several commands to do this, one of which specifies the line spacing in 216ths of an inch. If you need to make such fine adjustments in the line spacing, see Appendixes G or J for the proper commands. In Chapter 6 you'll see how useful changes in line spacing can be for dot graphics.

## **Paper-out Sensor**

Under the platen (the black roller) of your FX-286 printer is a small switch that senses whether or not paper is in the printer. When the end of the paper passes this switch, it triggers a signal that sounds the beeper and stops your printing. This saves wear on your print head, ribbon, and platen, but because of the distance between the switch and the print head, it stops the printing about two inches from the end of the page. Therefore, if you use single-sheet paper in your FX-286, you can't print on the last two inches of each page without an adjustment .

If you need to print on the last two inches of single-sheet paper, there are two solutions: send the printer an ESCape "8" or change one of the DIP switches described in Appendix A. Then the printer will ignore the paper-out signal and print on the last part of each page, but be careful not to allow the FX-286 to print when there is no paper in it. (Some computer systems ignore ESCape "8"; see the ESCape "8" section in Appendixes G or J.)

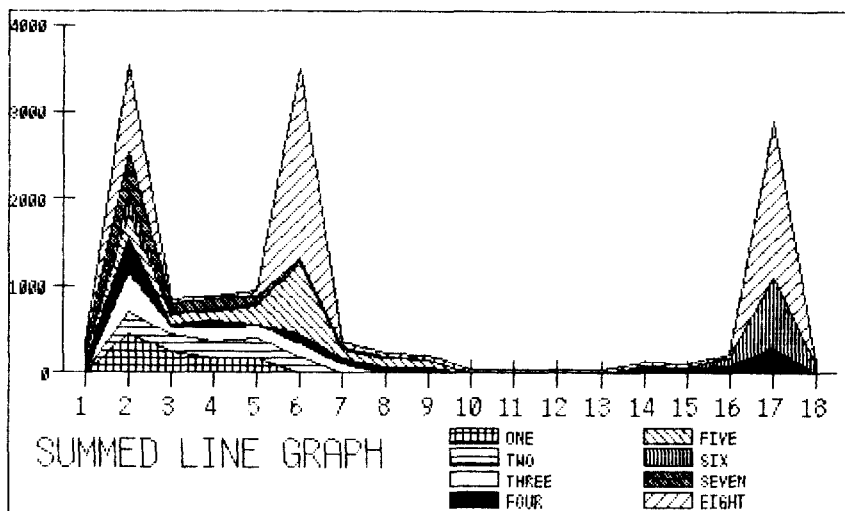
## Chapter 6

# Introduction to Dot Graphics

The dot graphics mode allows your FX-286 to produce pictures, graphs, charts, or almost any other pictorial material you can devise. Instead of using the standard letters and numbers, the graphics mode prints dots column by column and line by line. You plan where you want the dots to appear and then use a program to tell the FX-286 where to put them.

Because many software programs use dot graphics, you may be able to print pictures and graphs like the ones on this page and the next by simply giving your software a few instructions. A graph like the one on the next page can be created and printed in a short time.





The quickest and easiest way to print graphics on your FX-286 is to use a commercial graphics program. With such programs you usually create an image on your monitor or TV screen and then give a command to send the image to the printer.

If you use commercial software that produces graphics, all you need to know about dot graphics is how to use the software. If, on the other hand, you wish to do your own programming or merely wish to understand how the FX-286 prints graphics, read on.

## Dot Patterns

Graphic images are formed on the FX-286 about the same way that pictures in newspapers and magazines are printed. If you look closely at a newspaper photograph, you can see that it is made up of many small dots. The FX-286 also forms its images with patterns of dots, as many as 240 dot positions per inch horizontally and 72 dots per inch vertically. The images you print on the FX-286 can, therefore, be as finely detailed as the one on the first page of this chapter.

If you plan carefully where you want the dots to appear and then use or create a program that gives the proper instructions to the printer, your FX-286 will print almost any picture you can imagine.

## The Print Head and Graphics

Chapter 4 told you a little about how the print head on the FX-286 prints letters: It receives a code for a letter and then fires a pattern of pins to form that letter.

In the main graphics mode, however, the FX-286 prints only one column of pins for each code it receives, and it uses only the top eight of the nine pins.

Therefore, your graphics program must send codes for dot patterns, one number for each column in a line. For each of those columns the print head prints the pattern of dots you have specified.

To print figures taller than eight dots, the print head makes more than one pass. It prints one line, then advances the paper and prints another, just as it does with text.

To keep the print head from leaving gaps between the graphics lines as it does between the text lines, the line spacing must be changed to eliminate the space between lines. With a change in line spacing, the FX-286 can print finely detailed graphic images that give no indication that they are made up of separate lines, each no more than 8/72nd of an inch tall.

Each pass of the print head prints one piece of the total pattern, which can be as tall or short and as wide or narrow as you desire. You don't have to fill the whole page or even an entire line with your graphics figures. In fact, you can use as little or as much space as you like for a figure and put it anywhere on the page.

## Graphics Mode

The graphics mode command is quite different from the other commands covered so far in this manual. For most of the other FX-286 modes, such as emphasized and double-width, one ESCape code turns the mode on and another turns it off. For graphics, the command is more complicated because the code that turns on a graphics mode also specifies how many columns it will use. After the FX-286 receives this code, it interprets the next numbers as pin patterns and prints them on the paper.

The FX-286 has several different graphics densities, but the first exercises keep things simple by using only one. The code for entering single-density graphics mode is ESCape "K" n1 n2. In BASIC the command is given in this format:

```
LPRINT CHR$(27)"K"CHR$(n1)CHR$(n2);
```

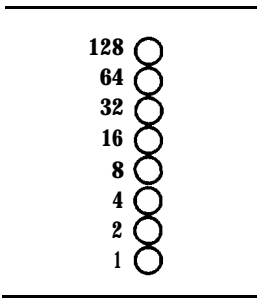
ESCape "K" specifies single-density graphics, and the next two numbers (n1 and n2) specify the number of columns reserved for graphics.

The graphics command requires more than one number to specify how many columns to reserve because as many as 1920 columns on an eight-inch line are possible in graphics printing. Since the FX-286 doesn't use decimal numbers larger than 255, the graphics mode command uses two numbers for reserving columns.

To figure the number of columns reserved, multiply the second number by 256 and add it to the first number. Since the command is set up for two numbers, you must supply two even if you only need one. When you need less than 256 columns, just make n1 the number of columns you are reserving and make n2 a zero.

### Pin Labels

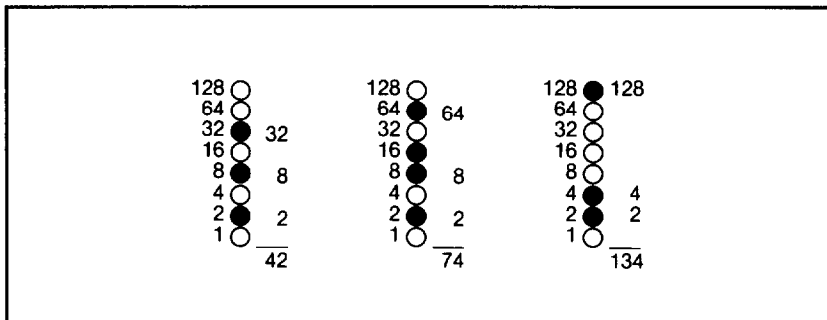
Once you put the printer into graphics mode and reserve the number of columns you want, your next step is to tell the print head which pins to fire in each column. There are 256 possible combinations of eight pins, and you send only one number for each column. The numbering system that allows you to use a single number to specify which of the 256 possible patterns you want is shown in Figure 6-1 .



**Figure 6-1. Pin labels**

To fire any one pin, you send its number. To fire more than one pin at the same time, add up the numbers of the pins and send the sum to the printer. With these labels for the pins, you fire the top pin by sending 128 . To fire the bottom graphics pin, you send 1. If you want to fire only the top and bottom pins, you simply add 128 and 1, then send 129.

By adding the appropriate label numbers together, you can fire any combination of pins. Figure 6-2 shows three examples of how to calculate the number that will fire a particular pattern of pins.



**Figure 6-2. Calculating numbers for *pin patterns***

With this numbering system, any combination of the eight pins adds up to a decimal number between 0 and 255, and no numbers are duplicated.

Now that you know the principles of Epson graphics, you're ready for two simple exercises, more densities, and then something more complex as a basis for writing your own programs.

## First Graphics Program

Your first graphics exercise could be a program that prints a single column of dots, but it is difficult to see the pattern in a single column of dots, so this program prints the same pattern 40 times.

The first line is the code for 40 columns of single-density graphics. As usual, the example is in BASIC, but you can adapt it to the programming language you prefer.

```
NEW
10 LPRINT CHR$(27)"K"CHR$(40)CHR$(0);
```

The second line is the data that is printed as pin patterns. Be sure that you type in the semicolons in both lines:

```
20 FOR X=1 TO 40: LPRINT CHR$(74);: NEXT X
```

That's it. Run the program to see the result below. Although it is not as interesting as the examples at the beginning of this chapter, it does allow you to see exactly how the mode works.



## WIDTH Statements

Some software (including most versions of BASIC) automatically inserts the control codes for a carriage return and a line feed after every 80–130 characters. This insertion is usually no problem with text, but it can spoil your graphics. In the graphics mode it may insert the control codes in the middle of a line.

You can usually prevent these unwanted control codes with a WIDTH statement. The format in IBM PC BASIC is shown below:

```
WIDTH "LPT1:",255
```

In Microsoft BASIC it is:

```
WIDTH LPRINT 255
```

If you have another version of BASIC, consult your manual for the proper format.

Put a WIDTH statement in one of the first lines of all your graphics programs. It is easier to put a WIDTH statement in all of your programs than to examine each one to see whether or not such a statement is necessary

## Multiple-line Exercise

Now that you've entered and run a simple graphics program, the next exercise shows you how the FX-286 combines several lines of graphics for a figure taller than eight dots.

Start with a line for 100 columns of single-density graphics and lines to print two pin patterns. Notice that since there are two pin patterns in the loop, it is only executed 50 times. (Remember to use the proper format for the WIDTH statement in line 10 . )

```
NEW
10 WIDTH "LPT1:",255
40 LPRINT CHR$(27)"K"CHR$(100)CHR$(0);
50 FOR X=1 TO 50: LPRINT CHR$(85)CHR$(42);
60 NEXT X: LPRINT
100 LPRINT CHR$(27)"@"
```

If you run the program now, you'll see how one line of the pattern looks:



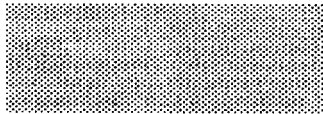
To see how more than one line combines to form a figure, enter and run the following program, which uses the lines you have already typed and adds several more.

```
10 WIDTH "LPT1:",255
20 LPRINT CHR$(27)"A"CHR$(7)
30 FOR R=1 TO 3
40 LPRINT CHR$(27)"K"CHR$(100)CHR$(0);
50 FOR X=1 TO 50: LPRINT CHR$(85)CHR$(42);
60 NEXT X: LPRINT
70 LPRINT CHR$(27)"K"CHR$(100)CHR$(0);
80 FOR X=1 TO 50: LPRINT CHR$(42)CHR$(85);
90 NEXT X: LPRINT: NEXT R
100 LPRINT CHR$(27)"@"
```

If you're using the IBM Proprinter mode on the FX-286, add the following line:

```
25 LPRINT CHR$(27)"2"
```

Now run the program to see the six print lines combine into a pattern:



Because the short and simple program that produced the pattern demonstrates many elements of graphics programming, each line is explained below.

Line 20 changes the line spacing to 7/72 of an inch, which is the height of the dot patterns used in the program. Therefore, there is no space between the print lines.

Line 30 begins a loop to produce multiple print lines. Lines 40 and 50 were explained previously. Lines 70 and 80 are similar to lines 40 and 50 except that line 80 uses a reversal of the patterns in line 50. As the loop is executed, the program prints lines 50 and 80 alternately so that the patterns of the print lines will fit together well.

Notice that the graphics command can be in effect for only one print line. The command is in lines 40 and 70 so that it is issued each time a new print line is begun. To print more than one line of graphics, the graphics command must be issued before **each** line.

Line 100 is the reset code to return the printer to its defaults.

## Density Varieties

Although all the examples so far in this chapter have been in the singledensity graphics mode, the FX-286 offers seven other eight-pin density modes and two for nine-pin. Nine-pin graphics (Epson mode only) is not necessary for most uses, but you can find the command (ESCape “^”) in Appendix G. All the eight-pin densities and their commands are described in Table 6-1.

**Table 6-1. Graphics modes**

Mode	Density	Alternate code	Description	Head speed (in./Sec.)
0	Single	ESC K	60 dots per inch; 480 dots per 8" line 816 dots per 13.6" line	16
1	Low-Speed Double	ESC L	120 dots per inch; 960 dots per 8" line 1632 dots per 13.6" line	a
2	High-Speed Double	ESC Y	Same density as Mode 1, but faster. The printer does not print consecutive dots in any one row.	16
3	Quadruple	ESC Z	240 dot position per inch; 1920 dot position per 8" line; 3264 dot position per 13.6" line The printer does not print consecutive dots in any one row.	8
4	CRT I	none	80 dots per inch; 640 dots per 8" line; 1088 dots per 13.6" line Matches the screen density of the QX-10: (This makes it easy to do screen dumps.)	8
5	One-to-one (plotter)	none	72 dots per inch 576 dots per 8" line; 979 dots per 13.6" line Produces the same density horizontally as vertically, which makes circles look round	12
6	CRT II screens	none	90 dots per inch; 720 dots per 8" line; 1224 dots per 13.6" line	8
7	Dual-Density Plotter	none	144 dots per inch 1152 dots per 8" line 1958 dots per 13.6" line Twice the density of Mode 5	3

Note: Only modes 0-3 are available in the IBM mode.

This chapter uses the term **dot positions** instead of **dots** for two densities: high-speed double and quadruple. Because the FX-286 does not print consecutive dots in a row in these densities, it cannot print dots in all the possible dot positions in any one row. For example, an eight-inch high-speed double-density row has 960 places where the

FX-286 can put a dot (dot positions), but only half of them can be used on any one pass of the print head. Having twice as many possible dot positions enables high-speed double-density designs to have a higher resolution than single-density ones even though consecutive dots are not used.

You are familiar with the command format that uses the ESCape code and a letter, but FX-286 graphics commands in the Epson mode can also be in the following format:

```
LPRINT CHR$(27) "*"CHR$(m)CHR$(n1)CHR$(n2) ;
```

with m being the mode number found in the left column of Table 6-1. As usual, n1 and n2 reserve the number of columns for graphics. The eight modes include seven densities, with two speeds for double-density

## Reassigning Code

The FX-286 (in the Epson mode only) has a graphics command that changes one graphics mode to another. You can use it with many commercial graphics software programs to change the density and shape of your printouts. The code is ESCape "?s" n, where s is one of the four alternate graphics codes (K, L, Y, or Z) and n is the number of the new code (0-6).

For example, if you send the following code before you run a graphics program, it will change every instance of mode "Y" (high-speed double-density) to mode 5 (one-to-one).

```
LPRINT CHR$(27) "?Y"CHR$( 5)
```

As usual, this example is in BASIC, but you can send the code in any programming language.

Even if you don't know which code your graphics program uses, a little experimentation should tell you whether the reassigning code can improve your graphics printouts.

## Column Reservation Numbers

Now that you've seen the rest of the eight-pin graphics densities and the reassigning code, this section explains in more detail the part of the graphics command that reserves the number of columns for graphics (the numbers n1 and n2 in the examples).

If you need fewer than 255 columns of graphics,  $n1$  is the number of columns you want and  $n2$  is zero. As you can see in Table 6-1, however, a single eight-inch line will hold as many as 1920 columns in quadruple-density. Specifying more than 255 is where the second number slot ( $N2$ ) fits in. The first number that you send ( $n1$ ) indicates a number of columns, but the second does not represent a number of columns; it is multiplied by 256 and added to  $n1$ . The command for the maximum number of dot positions you can reserve is:

```
CHR$(27)"* "CHR$(3)CHR$(192)CHR$(12);
```

which is 192 dot positions plus 12 times 256 dot positions, for a total of 3264 dot positions in one row.

Once you have chosen the number of columns you want to use, you can have your program do the calculations for you with the following format:

```
CHR$(27)"L"CHR$(N MOD 256)CHR$(INT(N/256));
```

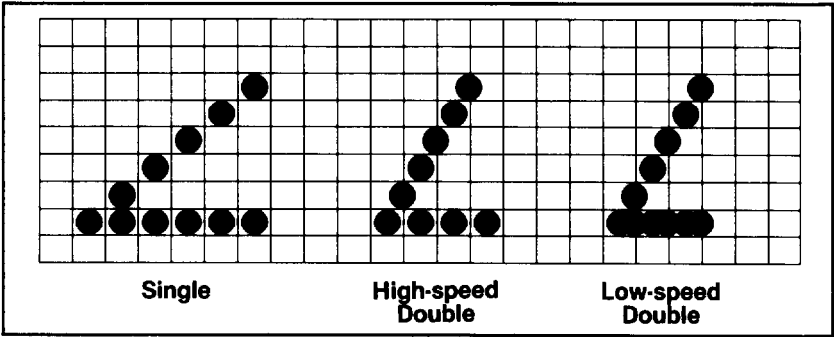
The variable  $N$  is the total number of columns you want to specify. The MOD (modulus) function calculates the value for  $n1$ , and the INT (integer) function calculates the value for  $n2$ . For programming languages other than BASIC, consult your manual for the proper form for these functions.

This format can be used with any graphics density and with any value of  $N$  up to the maximum number of columns per line for that density.

## Designing Your Own Graphics

This section takes you through the development of a graphics program. The example is not especially complicated, but it does include the same steps you would use for a more complex figure so that you have the basis for designing graphics on your FX-286.

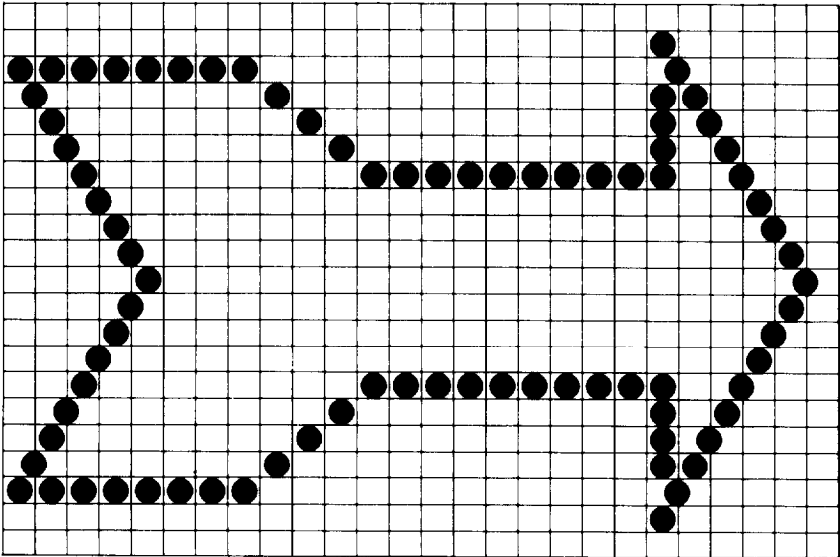
You should plan your figure with dots on graph paper, but before beginning to place the dots, you must decide which graphics density you want. Figure 6-3 shows the differences between the three most-used graphics modes so that you can choose the one you want.



**Figure 6-3. Designing in different densities**

In this figure you can see the main rules for graphic design in the three densities. In single density no dots can be placed on vertical lines. In high-speed double density dots can be placed on vertical lines, but no dots can overlap. In low-speed double density dots can be placed on vertical lines and they can overlap.

Now look at the figure designed for high-speed double density. It should point you in the right direction for your own designs.



**Figure 6-4. Arrow design**





Remember to use the proper format for your system for the WIDTH statement in line 90 .

In this program the number 128 in the DATA statements signals the end of a print line. This is the reason for the IF-THEN statement in line 610 that skips to line 650 and causes a line feed.

The other special technique used in this program is found in lines 620 and 630. Since some of the data numbers are repeated many times, using negative DATA numbers for repetitions saves typing. Line 620 tests for a negative number, and if it finds one, reads the next two numbers and prints their pin patterns the number of times indicated by the negative number.

For example, when the minus 6 in line 800 is read, the program then reads the next two numbers (8 and 0) and sends them to the printer 6 times. This feature is not a necessary part of the program, but it does allow you to type fewer data numbers.

Otherwise the program is a straightforward graphics program that uses seven-dot line spacing and reads numbers from DATA statements and sends them to the printer. If you want to see the figure in other densities, change the "Y" in line 600 to "L" or "Z".

## String variables

In a long and complicated graphics program, typing in the graphics command or repetitive data numbers over and over can become time-consuming. You can avoid much of the repetitive typing by storing commands and data in string variables.

Look at the program below. It is the same as the multiple-line exercise earlier in the chapter except for the string variables.

```
10 WIDTH "LPT1:",255
20 G$=CHR$(27)+"K"+CHR$(100)+CHR$(0)
30 A$=CHR$(85)+CHR$(42)
40 B$=CHR$(42)+CHR$(85)
50 LPRINT CHR$(27)"A"CHR$(7)
60 FOR R=1 TO 3
70 LPRINT G$;
80 FOR X=1 TO 50: LPRINT A$;; NEXT X
90 LPRINT
100 LPRINT G$;
110 FOR X=1 TO 50: LPRINT B$;; NEXT X
120 LPRINT: NEXT R
130 LPRINT CHR$(27)"@"
```

Notice that the first line stores the whole graphics command in one string variable. In order to do this you must put plus signs between the elements of the command. Once you have done this at the beginning of the program, each time you enter `LPRINT G$`; you have issued the graphics command. Lines 20 and 30 do the same thing with the data used in this program. As you can see, the use of string variables saves some typing even in this short program. In a long program it can save you much more time and effort .



# Chapter 7

## User-Defined Characters

The FX-286 has several hundred different characters stored in its Read Only Memory (ROM). Although this number includes draft, Near Letter Quality, international, IBM, italic, and graphics characters, sometimes you would like to have a few more. For those occasions when you need a special character or even a whole new typeface, the FX-286 allows you to create your own characters and print them just as if they were ordinary letters.

This chapter describes how to use the user-defined character function in the Epson mode. The IBM Proprinter mode also has a limited user-defined character function. For information on its use see the ESCape "=" and ESCape "I" commands in Appendix J.

### Defining Your Own Characters

The printout below displays a few such characters to give you an idea of what can be done, but remember that you can create whatever you need or want.



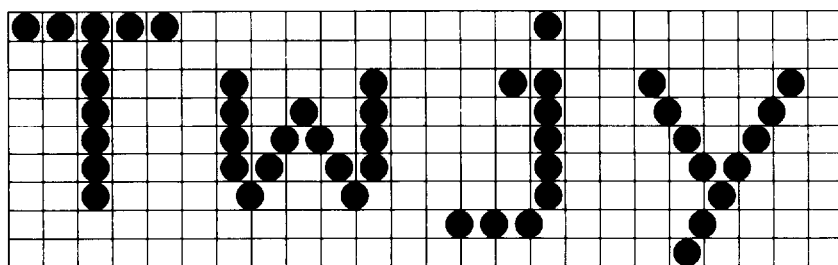
It may seem that designing a character and telling the FX-286 how to print it would be extremely complicated, but in this chapter the task is reduced to a simple three-step process: planning your character, running one program that tests your work and calculates the required DATA numbers, and running another program to put the character in your printer's Random Access Memory (RAM) for use whenever you need it.

After you have created your own characters, you can re-program seldom-used keys to generate the user-defined characters. For example, you will be able to type < to print **y** .

Your user-defined characters can be utilitarian or imaginative, anything from a scientific symbol to script letters for your initials. Just follow the simple steps below.

The characters you define must follow the same rules that govern the rest of the characters printed by the FX-286. Also, they can be in draft mode only. In Figure 7-1 are four pica letters with a grid of lines behind them so that you can see how they are designed.

As you look at these characters, notice the three rules that govern their design: The column on the right side is always left blank so that there will be spaces between the characters on a line; a character can use the top row or the bottom row, but no character uses both the top and the bottom row; and a dot can be placed on a vertical line only when the columns next to that line are not used.



**Figure 7-1. FX-286 dot-matrix characters**

## Designing Process

Suppose that you want to print the scientific symbol for the planet Mercury. Although the FX-286 has a number of special symbols, Mercury's symbol is not one of them. You can, however, create and print such a symbol with ease. First, use a grid like the one in Figure 7-2 to plan where to place the dots.

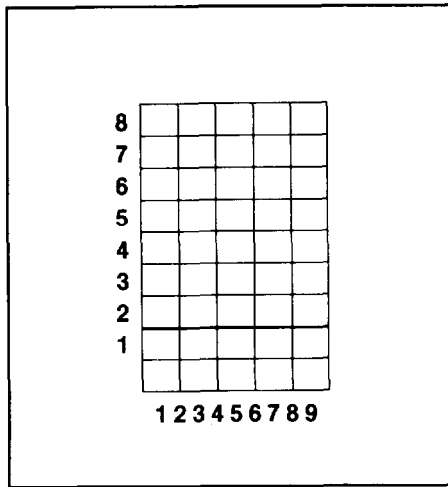


Figure 7-2. **Grid for designing draft characters**

Because the last two columns are reserved for the space between characters, they are not included in the grid. And since most characters do not use the bottom two rows, a heavy line indicates the usual lower limit for an FX-286 character.

When you place your dots on this grid, remember that dots cannot go on horizontal lines, but they can go on vertical lines **as** long as they do not overlap any other dots. As you design your characters, draw the dots as large as you see them in the example on the left in Figure 7-3. If you draw them smaller, you may have overlapping dots without realizing it.

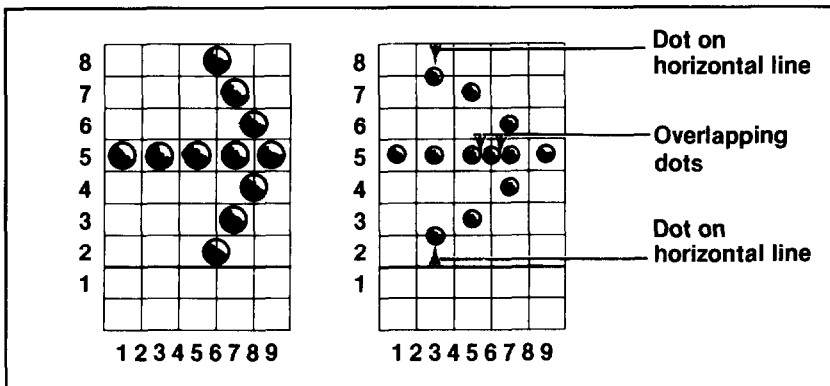


Figure 7-3. **Correct and incorrect designs**

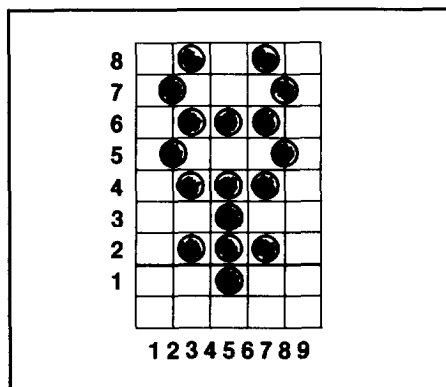
If you do accidentally call for overlapping dots, don't worry. The program will still work, but only one of the dots will be printed.

## Definition program 1

The BASIC program below will help you translate your design into a character your FX-286 can print. Type in the program. Then follow the instructions given after the program.

```
NEW
100 DIM F(9)
110 FOR I=1 TO 9
120 PRINT "WHICH ROWS HAVE DOTS IN COLUMN";I
130 INPUT R: IF R=0 THEN 150
140 F(I)=F(I)+2^(R-1)
150 IF R=0 THEN NEXT I ELSE GOTO 130
160 LPRINT CHR$(27) ":"CHR$(0)CHR$(0)CHR$(0);
170 LPRINT CHR$(27) "% "CHR$(1)CHR$(0);
180 LPRINT CHR$(27) "&"CHR$(0)CHR$(60)CHR$(60);
190 LPRINT CHR$(128);
200 FOR X=1 TO 9
210 LPRINT CHR$(F(X));: NEXT X
220 LPRINT CHR$(0)CHR$(0);
230 LPRINT "YouR ChARACTER IN PICA: < < <"
240 LPRINT "IN EXPANDED EMPHASIZED PICA: ";
250 LPRINT CHR$(27) "!*< < <"
260 LPRINT CHR$(27) "!"CHR$(0)"YOUR DATA NUMBERS:"
270 FOR K=1 TO 9: LPRINT F(K);: NEXT K
300 LPRINT: END
```

So that you can see how the program works, the next paragraphs present the steps used to create the symbol for Mercury. First is the grid used to design the character.



**Figure 7-4. Design for character**

## Running the program

Now run the program. For each of the nine columns, the program asks for the numbers of the rows in which you want dots to appear. Enter the row numbers one at a time, pressing the **RETURN** key after each one. When you have entered all the numbers for a column or when you want no dots in a column, press **RETURN** without a number. Remember that the vertical lines in the grid are the even-numbered columns.

To see program 1 produce the character in Figure 7-4 run the program and follow these instructions: When the screen message asks what rows have dots in column 1, respond with **RETURN** to indicate that no dots go in that column. For column 2 (the vertical line), press **7**, **RETURN**, **5**, and **RETURN** again to indicate that you want dots in rows 7 and 5. Then press **RETURN** alone to indicate that no more dots go in column 2. For column 3 press **8**, **6**, **4**, and **2**, with a **RETURN** after each of them. Then press **RETURN** to finish with column 3 and go on to column 4.

For column 4 press **RETURN** only. (The rest of the directions assume that you **know** to press **RETURN** after each number and one extra time to end the entries for each column.) For column 5, enter **6**, **4**, **3**, **2**, and **1**. For column 6, press **RETURN** only; for column 7 enter **8**, **6**, **4**, and **2**; for column 8 enter **7** and **5**; and for column 9 press **RETURN** only.

Now wait a moment for your computer to calculate the dot patterns and your FX-286 to print the new character in two different styles. Your printout also gives you nine numbers, which you will use in the next program. You should get the printout you see below:

```
YOUR CHARACTER IN PICA::  ¶¶¶
IN EXPANDED EMPHASIZED PICA:  ¶¶¶
YOUR DATA NUMBERS:
0 80 170 0 47 0 170 80 0
```

When you get to this point with a character of your own, you see how it looks and whether or not you like it. If you want to make any changes, move the dots on the grid as needed and re-run the program.



If you want to put dots in the bottom row, change the number in line 190 from 128 to 0. Then the usable rows will be as shown in Figure 7-5.

8									
7									
6									
5									
4									
3									
2									
1									
	1	2	3	4	5	6	7	8	9

**Figure 7-5. Using the bottom eight rows**

### Definition program 2

Once the character looks right, type in the next program. The program as listed creates the symbol for Mercury, but you can use it for any character you create if you make one or two changes explained after the program listing.


```

NEW
100 LPRINT CHR$(27) ":"CHR$(0)CHR$(0)CHR$(0);
110 LPRINT CHR$(27) "%"CHR$(1)CHR$(0);
120 LPRINT CHR$(27) "&"CHR$(0)CHR$(60)CHR$(60);
130 LPRINT CHR$(128);
140 FOR X=1 TO 9
150 READ R
160 LPRINT CHR$(R);: NEXT X
170 LPRINT CHR$(0)CHR$(0);
200 DATA 0,80,170,0,47,0,170,80,0
300 END

```

To use program 2 for your own character, change the DATA numbers in line 200 by substituting the numbers generated by program 1 .

## **Running the program**

When you run this second program, it re-defines the < character. After you run the program, if you press < your FX-286 will print  (although your screen will continue to show the character <).

Because the program puts this new definition in your printer's Random Access Memory (RAM), it will print the new character unless it is turned off or receives the reset code.

If you have designed a character and want to use it with your word processing program, for example, just run program 2 before you start using your word processing program.

If you wish, you can define more than one character; see the section on user-defined characters in Appendix C for details.

# Appendix A

## Defaults and DIP Switches

This appendix lists the default settings of the FX-286 printer and lists and describes the functions of the DIP switches-small switches inside the printer that control a number of important printer functions.

### Default Settings

When your FX-286 comes from the factory, it is set to the following defaults. Defaults are the settings in effect each time the printer is turned on. A dot (•) means that you can change the default for this setting by changing a DIP switch.

- Pica pitch

Margins set at maximums: left margin at 0 and right margin at 136.

1/6-of-an-inch line spacing

Page length of 11 inches

Vertical tabs set at every two lines

Horizontal tabs set at every eight spaces

- Epson mode
- USA character set
- Paper-out sensor on
- Carriage return issued at the end of a line without an automatic line feed

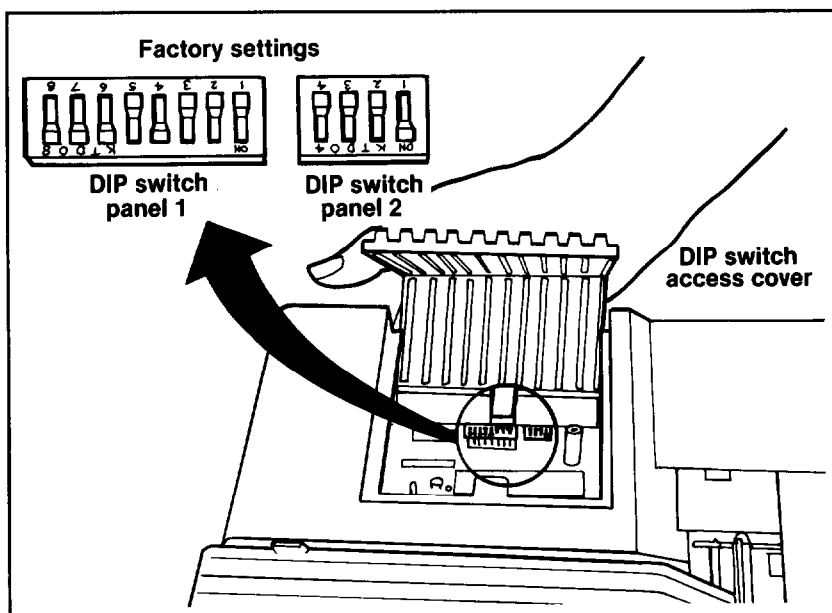
Top-of-page is set at the position of the print head when you reset the printer-by turning power on or by issuing an ESCape “@“-or when you change the page length with ESCape “C”.

## The DIP Switches

Several tiny switches called DIP (for Dual In-Line Package) switches are inside the FX-286 printer. These switches control a number of important printer functions. Although the factory settings are the best for most uses, you may want to change some of them.

The design of the FX-286 gives you easy access to the switches, which are under the access cover on the right side of the printer. To remove the cover, use a Phillips screwdriver to remove the top screw. Then press the cover down and sideways with the palm of your hand as shown in Figure A-1.

Figure A-1 also shows the location of the switches and their factory settings.



**Figure A-1. DIP switch location**

Always turn the power OFF (with the switch on the left side of the printer) before you change the setting of any of these switches. Any changes made while the power is on will be ignored until you turn the printer off and back on. So set all switches with the power off.

## Selecting the IBM Proprinter Mode

To set the FX-286 in the IBM Proprinter mode, you need to reset three DIP switches. Once the FX-286 is set in the IBM mode, the printer responds to commands like a Proprinter, and prints in the selected character set.

Reset the following DIP switches to select the Proprinter mode:

<b>DIP switch</b>	<b>Factory Setting</b>	<b>Proprinter Setting</b>
1-4	ON	OFF
2-1	ON	OFF
2-3	OFF	ON

## Printing the Alternate and All Print character sets

The IBM Proprinter has three character sets: Standard, Alternate, and All Print (see Appendix K for printouts of all three sets). Two of the sets, Standard and Alternate, can be selected with DIP switches. The third set, All Print, can only be selected with ESCape code "\ " or "^". See Appendix J for complete descriptions of these codes.

The DIP switch settings for the Standard and Alternate sets are:

<b>DIP Switch</b>	<b>Standard</b>	<b>Alternate</b>
1-6	ON	Set any one of these three switches to OFF.
1-7	ON	
1-8	ON	

## Running the self test in the IBM Proprinter mode

If you want to run a self test to see what the IBM Proprinter character sets look like, you only have to reset DIP switch 1-4 from ON to OFF.

To run the self test, make sure the power is OFF, then hold down the DRAFT button while turning the power switch ON-the self test

The diagram consists of a grid of symbols. The symbols are arranged in rows and columns. The symbols include Greek letters (alpha, beta, gamma, delta, epsilon, zeta, eta, theta, iota, kappa, lambda, mu, nu, xi, omicron, pi, rho, sigma, tau, upsilon, phi, chi, psi, omega), the Greek letter sigma (Σ), and the Greek letter tau (τ). The symbols are arranged in a way that suggests a sequence or a path. A diagonal path of black squares runs from the bottom-left towards the top-right, passing through the center of the grid. The symbols are arranged in a way that suggests a sequence or a path.

If you want to see the Alternate set, turn the power OFF. Then reset **either** switch 1-6, 1-7, or **1-8** from ON to OFF, and run the self test again.

Tables A-1 and A-2 **show** you the functions of all the switches, and the rest of the appendix explains each of them.

### Switch 1

No.	ON	Function	OFF
1-1	Condensed	Print mode	
1-2	Ø (slashed)	Zero character	
1-3	Inactive	Paper-out sensor	
1-4		Printer mode	IBM
1-5	Emphasized	Print mode	
1-6		International character set See Table A-2.	OFF
1-7			OFF
1-8			OFF

No.	ON	Function	OFF
2-1		Printer select	Inactive
2-2	Active	Cut-sheet feeder	
2-3	ON	Skip-over-perforation	
2-4	CR + LINE FEED	Automatic line feed	

A-4

**Table A-2. International DIP switch settings**

Country	Switch 1-6	Switch 1-7	Switch 1-8
USA	On	On	On
France	On	On	Off
Germany	On	Off	On
United Kingdom	On	Off	Off
Denmark	Off	On	On
Sweden	Off	On	Off
Italy	Off	Off	On
Spain	Off	Off	Off

**Switch 1-1**-Selects pica or condensed printing. On is condensed; off is pica. Regardless of the setting, you can still select condensed with SelecType and either condensed or pica with ESCape codes.

**Switch 1-2**-Controls the printing of zeroes. When it is on, the zeroes are slashed (0); when it is off, they are not.

**Switch 1-3**-Controls the paper-out sensor. When it is on, the printer will ignore the lack of paper, causing printing to continue even when the printer is out of paper. When it is off, the printer stops and sounds the beeper when the end of the paper passes the paper-out sensor. The PE (Paper End) signal will go out of pin **12** on the host connector regardless of the setting of switch **1-3**. See ESC 8 in Appendix G or J.

**Switch 1-4**-Selects the printer mode. When it is on, the printer uses the control codes and character sets of the Epson mode; when the switch is off, the printer uses the control codes and character sets of the IBM Proprinter mode. Chapter 5 explains the differences between the two modes. Appendixes H and K show the Epson and IBM Proprinter character sets, respectively. Appendixes G and J explain the Epson and IBM Proprinter commands, respectively.

**Switch 1-5**-Selects emphasized or standard printing. When it is on, printing is emphasized; when it is off, printing is standard. Regardless of the setting, you can select emphasized with SelecType and either emphasized or standard with ESCape codes.

**Switches 1-6, 7-7, and I-B**-Select an international character set. See Table A-2 for the settings, and see Chapter 5 for information on the use of the international sets.

The IBM Proprinter mode does not divide its international characters into sets. It does, however, have two character sets, which you can see in Appendix K. If the FX-286 is in the IBM Proprinter mode (switch 1-4 off), it uses the standard character set unless any one of these switches (1-6, 1-7, or 1-8) is off. Therefore you can choose the Alternate IBM Proprinter character set by turning switch 1-4 off and turning off any one of these three switches (1-6, 1-7, or 1-8).

**Switch 2-1**-Controls printer selection. When it is on, it activates the SLCT IN signal, and the printer actively processes commands sent from the computer; it cannot be deactivated by software codes. When this switch is off, the printer can be activated and deactivated by external software codes. ASCII 19 (DC3) turns off printing. While the printer is inactive, all input data is ignored (until the printer is reactivated by DC1).

**Switch 2-2**-Controls the optional cut-sheet feeder. When it is on, the cut-sheet feeder is enabled. When it is off, the cut-sheet feeder is disabled. Leave it off unless you are using a cut-sheet feeder.

**Switch 2-3**-Controls the skip-over-perforation feature. When it is on, the printer skips six lines after each 60 lines of printing. When the switch is off, this feature is inactive.

**Switch 2-4**-Controls line feeds. When it is on, the FX-286 adds an automatic line feed to each carriage return; when it is off, it does not. If your printing has an extra space between lines, turn the switch off. If all the lines of your printing are on top of each other, turn the switch on.



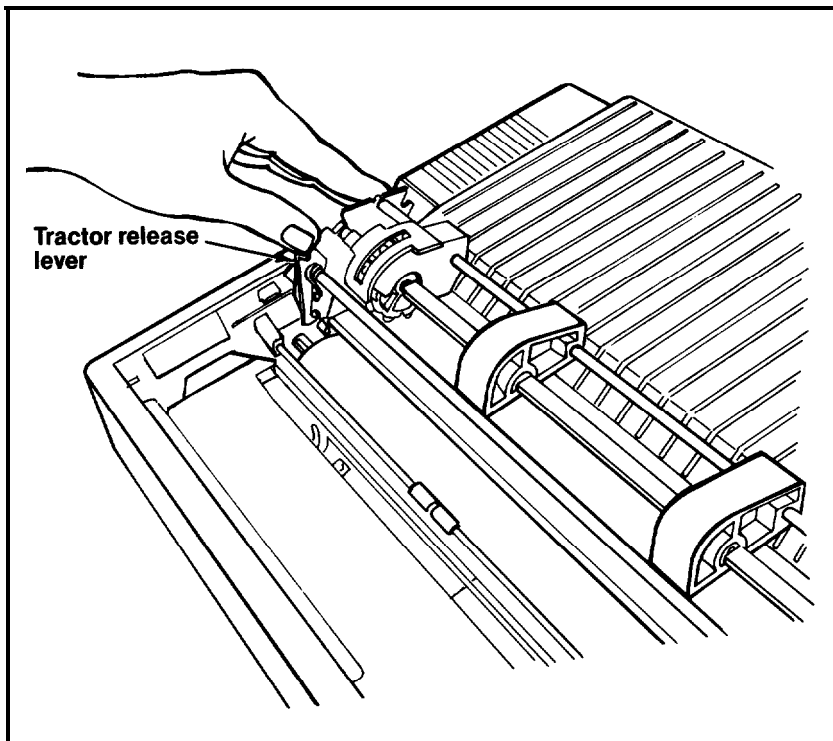
## Appendix B

### Loading Single-sheet Paper in the FX-286

Although the FX-286 is delivered with a tractor feed unit already installed, there may be times when you will want to print on single-sheet paper rather than continuous form.

#### Removing the Tractor Unit

Removing the installed tractor unit is easy. Simply push back on the tractor release levers as shown in Figure B-1 , tilt the unit back, and lift it off the printer.

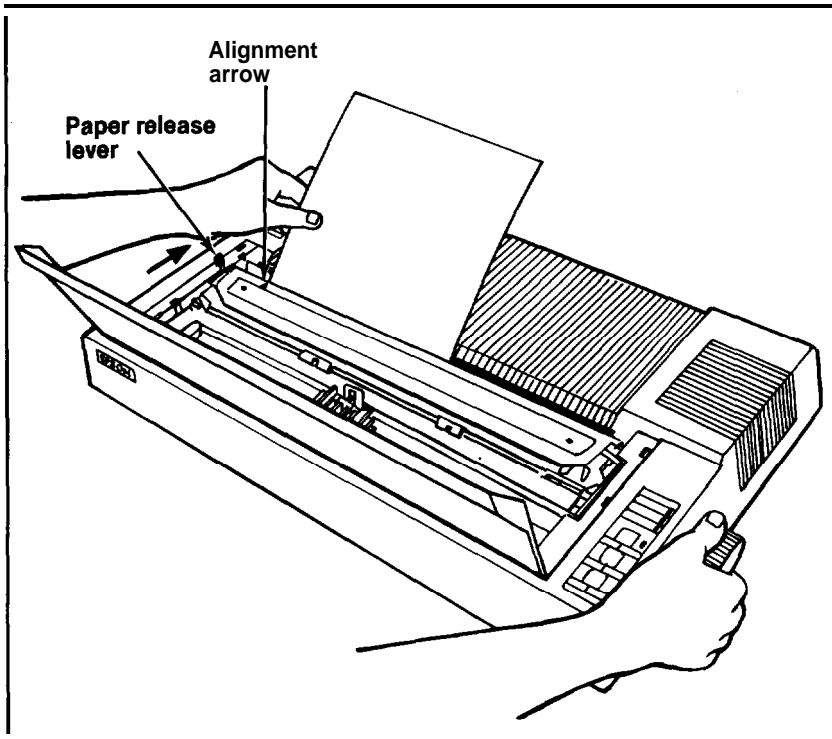


**Figure B-1. Removing the tractor unit**

## Loading Single-sheet Paper

Loading single-sheet paper in the FX-286 is just like loading paper in a typewriter.

1. Remove the dust cover by tilting it up and lifting it off the printer.
2. Now fit the front lid (pictured in B-2) onto the printer.
3. Make sure the paper release lever is pushed back in the direction of the arrow.
4. Line up the left edge of the paper with the alignment arrow marked on the metal plate as shown in Figure B-2. With the power OFF, use the paper feed knob to roll the paper into the printer. (If the power is ON, use the LINE FEED button.)



**Figure B-2. Loading single-sheet paper**

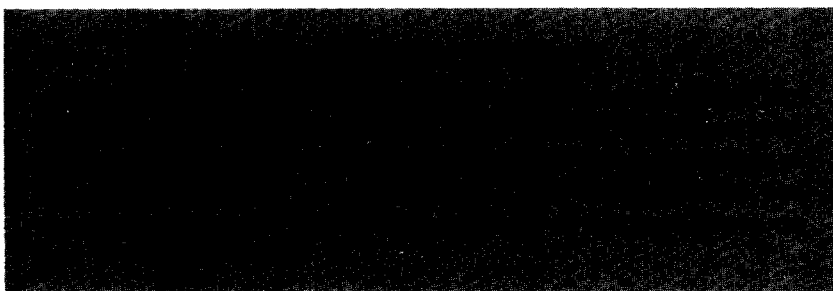
5. If you plan on extensive single-sheet printing, you can also install the protective center cover by clipping it into the slots shown in Figure B-2.

When loading single-sheet paper, you may find that the FX-286 breaks pages at different places than your word processor or applications program.

To ensure that your word processor and the FX-286 break pages at the same point:

1. Print out a page on the FX-286. Check that the FX-286 and your word processor have the same page length. If they differ, note how many lines they differ by. For example, if your word processor is set up to print 55 lines, but the FX-286 only prints 53 lines before ejecting the page, there is a difference of two lines.
2. You now have three choices:
  - a) Compensate for the two-line difference when rolling the paper into the printer.
  - b) Use the installation procedure on your word processor to change the default page length.
  - c) Use commands in your word processing program to alter the page or margin lengths in each file to accommodate the FX-286's page length.
3. Once you've established the best settings, always load the paper so that your word processor starts at the same place on each page. For example, you may find that when you roll the paper one inch above the paper bail, the page breaks are perfect-then each time you load paper, load it the same way.

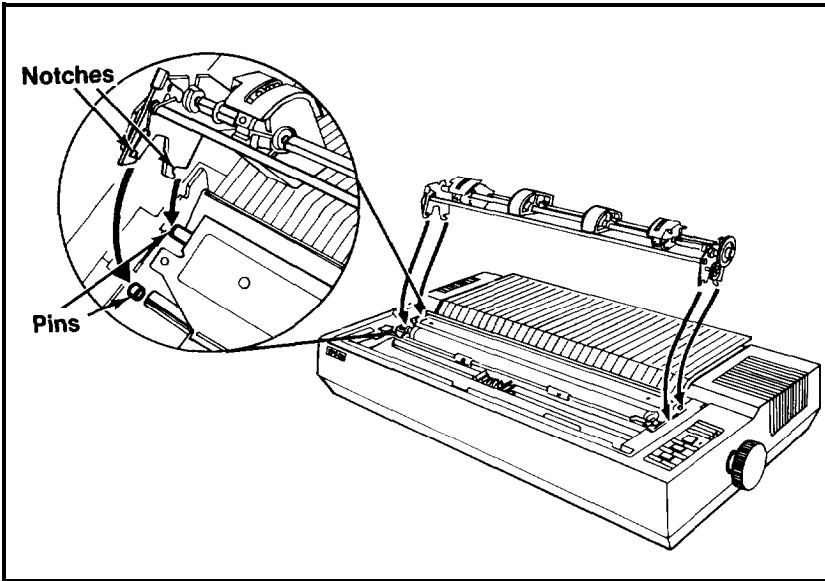
With single-sheet paper, the key to consistent page formatting is to establish the settings that work best for you, then position the paper in the same place every time.



## Installing the Tractor Unit

To reinstall the tractor unit on the FX-286:

1. Remove the center cover if it's been installed.
2. Hold the tractor with the gears to the right, and fit the notches in the tractor unit over the pins on the printer, as shown in Figure B-3.



***Figure E-3. Installing the tractor unit***

3. Tilt the unit forward until it clicks in place over the front pins.
4. Remove the front lid and replace it with the dust cover.

# Appendix C

## Troubleshooting and Problem Solving

This appendix presents explanations of the FX-286's advanced features and solutions for possible problems. If you have trouble or want to know more about some of the FX-286 features, consult the appropriate section in this appendix.

### Troubleshooting

This section gives solutions to a few possible problems.

#### Double-spacing or overprinting

If your FX-286 double-spaces when you expect it to single-space, or if it prints all the lines on top of each other, change DIP switch 2-4. See Appendix A.

#### Paper loading

If you have trouble while loading paper, check these four items:

1. Move the print head to the middle of the platen. (Be sure that the printer is OFF when you do this.)
2. See that the pin-feed holders are set for the correct width. If you are not sure, try moving them slightly farther apart.
3. See that no bits of paper are caught in the pin-feed holders.
4. Make sure the paper release lever is open (pulled toward the front of the printer).

## **Paper advancing**

If the printer advances the paper several pages at the end of each page of printing or each time it receives a form feed, see that DIP switch 2-2 is OFF when you are not using the optional cut-sheet feeder.

## **Tabbing**

Remember to set margins before tabs, not after.

## **Paper-out sensor will not turn off**

Some computer systems ignore both the DIP switch and the ESCape code that deactivate the paper-out sensor. See ESCape “8” in Appendix G or J.

## **Self-adhesive labels**

If you're printing labels and a self-adhesive label comes off of the backing, it may stick behind the platen and cause problems with paper feeding and irregular darkness of printing. If this happens, take your FX-286 to a qualified service person; do not attempt to remove the label yourself.

## **Graphics Solutions**

There are three common sources of problems with graphics programs in BASIC:

1. Unwanted codes for carriage returns and line feeds may be inserted by BASIC if lines are over 80 columns long or if semicolons are not used at the end of program lines between the graphics command and its data. See Chapter 6 for the proper format for a WIDTH statement and for sample programs that show the proper use of semicolons.
2. Some software will not send certain codes. For example, IBM PC BASIC will not send CHR\$(26). Read the “Hex Dump Mode” section in this appendix for further information.
3. If the printer stops during a graphics program, it may not have received enough data. The printer expects a certain number of pin patterns, determined by n1 and n2 in the graphics command. It will wait patiently until the quota is full. Note that nine-pin graphics (Epson mode only) require two bytes for each column of graphics.

## **Cancelling Unwanted Functions with SelecType**

If you want to cancel the modes you have set with SelecType, you can turn your printer off and back on with the power switch on the left side of the printer. This cancels all SelecType settings, returns your FX-286 to its defaults, resets the top-of-page, and empties the contents of the buffer, including any user-defined characters that you have stored there.

Occasionally you may wish to cancel one or more modes with SelecType instead of resetting the printer with power switch. To cancel all modes controlled by SelecType, simply enter SelecType mode and then press the FORM FEED button without pressing the OFF LINE button. This is useful when you make a mistake while setting codes and want to start over again, and it does not interfere with top-of-page, user-defined characters, or other items that are not controlled by SelecType.

If you do make a mistake while using SelecType, just press the LINE FEED button to turn off SelecType and then turn it on again and press the FORM FEED button before you press the OFF LINE button.

In fact, you can use the FORM FEED button to cancel any previous SelecType settings each time you use SelecType. If you want to be absolutely certain that no previous settings interfere with your use of SelecType, always press the FORM FEED button once immediately after you enter SelecType mode.

You can also cancel individual modes with SelecType if you wish. You do this with the same procedure that sets them. When a mode is already set, selecting it again cancels it, as explained below.

Suppose that you have set emphasized and double-strike modes and then you decide that you don't want double-strike. You can either cancel all the modes and reset emphasized, or you can use the following steps to cancel double-strike and leave emphasized.

1. See that the ON LINE and READY lights are on. (Be sure that you do not touch the power switch and cancel all the modes.)
2. Press the OFF LINE and FORM FEED buttons to enter SelecType.
3. Press the OFF LINE button six times. (This is the code for double-strike.) Notice that the ON LINE light is blinking and that it is on more than it is off. This tells you that the double-strike mode is set.

4. Press the FORM FEED button once. Now the ON LINE light is still blinking, but it is off more than it is on. This tells you that double-strike is cancelled.
5. Press the LINE FEED button once to leave SelecType mode.
6. Press the OFF LINE button to put the printer on line.

Now you have cancelled double-strike without affecting any other modes.

Some users think that this procedure is too complicated and prefer to cancel all the SelecType settings and then reset the ones they want. Use whichever method you prefer. If you want to cancel modes individually, remember to watch the ON LINE light. As it blinks, it is on more than it is off when a mode is set and off more than it is on when a mode is not set.

## **Beeper Error Warnings**

When the beeper on the FX-286 sounds, it usually indicates that the printer is out of paper. The beeper can also be sounded by any program that sends ASCII code 7 and by certain error conditions in the printer itself.

If the printer beeps and stops printing when it is not out of paper, turn the printer off and check to see if the paper is loaded correctly. If the paper is loaded correctly, turn the printer back on and try to print again. If the printer beeps and does not print again, take it to a qualified service person.

## **Using the Hex Dump Mode to Solve Problems**

The FX-286 has a special feature that makes it easy for experienced printer users to find the causes of problems. Called the hexadecimal (hex) dump mode, it gives a printout of exactly what codes reach the printer.

Enter this mode by turning on the power switch on the left side of the printer while holding down the FORM FEED and LINE FEED buttons at the same time. The printer responds by beeping. Then, when you run a program, either an applications program or one you have written in any programming language, the FX-286 prints one or more lines of hexadecimal numbers. The hexadecimal numbers are the codes received by the printer.



Therefore, if you ran the following BASIC program while your FX-286 was in the hex dump mode, you would get the printout below it. The printer will print all but the last line and then stop. Press the ON LINE button to make the printer print the last line.

```
10 FOR X=70 TO 73
20 LPRINT CHR$(X): NEXT X
30 LPRINT CHR$(27)"E"
40 LPRINT "Sample text"
50 LPRINT CHR$(27)"@"
```

```
46 0D 0A 47 0D 0A 48 0D 0A 49 0D 0A 1B 45 0D 0A 53 61 6D 70
5C 65 20 74 65 73 74 0D 0A 1B 40 0D 0A
```

You can consult Appendix A to see the meanings of the hexadecimal codes. The following explanation of the first line will put you on the right track for using the hex dump mode.

The first code is hex 46, which is the same as decimal 70, the code for "F". Then, because there is no semicolon in line 20, BASIC sends a carriage return and a line feed, hex codes 0D and 0A. The program then sends the hex codes 47, 48, and 49, with each followed by a carriage return and line feed.

When the program gets to line 30, it sends ESCape "E" and a carriage return and line feed. These are hex codes 1B, 45, 0D, and 0A. Now you can follow a hex dump printout on your own.

Some software changes one or more codes when sending them to the printer. The ability of the FX-286 to dump in hexadecimal lets you determine which codes are creating problems for your system.

A hex dump printout of a program shows you exactly what the printer is receiving, regardless of what the computer is sending. The following test program lets you check to see what codes, if any, are problems for your software. This program is in BASIC; use an equivalent program for another programming language.

```
10 FOR X=0 TO 255
20 LPRINT CHR$(X);
30 NEXT X
```

Put the printer in the hex dump mode and then RUN the program. Remember to press the ON LINE button to make the FX-286 print the

final line. Then compare your printout with the list of hex codes in order in Figure C-1. If any are skipped or repeated, you will know that your software changes some codes before it sends them to the printer.

00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF

**Figure C-1. Hexadecimal codes in order**

For example, in the lines below, which are the first two lines of the printout of the test program run with IBM PC BASIC, you can see that in this case BASIC adds hex 0A, which is the code for line feed, after hex 0D, the code for a carriage return. You will also notice that the ram does not send hex 1A, which is decimal 26. Both of these characteristics are discussed in the next section.

01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0A	0E	0F	10	11	12	13
14	15	16	17	18	19	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28

The hex dumping capability can help you debug a program quickly. Appendixes H or K will help you translate the hex codes to ASCII equivalents.

## System Solutions

The next three subsections give information that is helpful in using your FX-286 with certain specific computer systems.

## IBM PC BASIC solutions

There are three problems in using the IBM Personal Computer BASIC to drive a printer. First, the IBM PC BASIC inserts a carriage-return/line-feed (CR-LINE FEED) after each 80 characters you send it. Second, it adds an LINE FEED to each CR in an LPRINT statement. Third, it will not send hex 1A (decimal 26).

Here is the way to adjust the width when it is the only problem. Tell the computer that the print line is wider than 80 characters with this WIDTH statement:

```
WIDTH "LPT1:",255
```

The 255 is a special number that prevents the computer system from inserting a CR-LINE FEED into the line. Unless, of course, there's one in your program.

The extra line feed—CHR\$(10)—that accompanies each carriage return—CHR\$(13)—is no problem except when you need to use CHR\$(13) in a graphics program. Getting rid of the extra CHR\$(10) is rather complicated. First you open the printer as a random file:

```
OPEN "LPT1:" AS #1
```

Although this allows you to send any code to the printer, you can no longer use the LPRINT command. Instead, you must use a PRINT #1 command:

```
PRINT #1, "Now I can print anything"
```

This does allow you to print anything, but it ignores any previous **WIDTH** statements.

If you want to print more than 80 columns per line in a graphics program, you must therefore change your opening statement to include the appropriate WIDTH statement:

```
OPEN "LPT1:" AS #1 : WIDTH #1, 255
```

And for the programs in this manual, don't forget to use PRINT #1 instead of LPRINT.

There is no easy solution to the problem with CHR\$(26). It is best to change any instance of decimal 26 (hex **1A**) in your programs to another number.

## Applesoft BASIC Solutions

Applesoft BASIC does not use PRINT to send data to the screen and LPRINT to send data to the printer as Microsoft BASIC does. Therefore, you need to change the programs in this manual somewhat. In most cases all you need to do is to add two lines to each program and change all instances of LPRINT to PRINT. Add a line at the beginning of the program that states PR#1 and a line at the end that states PR#0.

For the programs in this manual that contain INPUT statements, put the line that states PR#1 after the INPUT statement.

## QX-10® and QX™-16 Solutions

The format for the WIDTH statement for the Epson QX-10 and QX-16 computers is:

```
WIDTH LPRINT 255
```

## User-defined Character Solutions

Chapter 7 gives you two programs to define up to one character, but you can define over 200 if you wish.

### Defining more than three characters

In order to define more than one character in Epson mode, you need to understand more about Definition program 1 in Chapter 7. Therefore, four lines from that program are reprinted and explained below.

```
160 LPRINT CHR$(27)" : "CHR$(0)CHR$(0)CHR$(0);  
170 LPRINT CHR$(27)"%"CHR$(1)CHR$(0);  
180 LPRINT CHR$(27)"&"CHR$(0)CHR$(60)CHR$(60);  
190 LPRINT CHR$(128);
```

In normal printing the FX-286 prints characters from its Read Only Memory (ROM), but user-defined characters are stored in its Random Access Memory (RAM). Therefore the commands in lines 160 and 170 are necessary for printing a mixture of user-defined and standard characters. The command in line 160 moves (or downloads) the characters from the ROM to the RAM. The command in line 170 tells the FX-286 to print only characters in the RAM.

The command in line 180 begins the definition process. It ends with two ASCII numbers that set up the range of characters to be defined. Since this program defines only one character, the two numbers are the same (both 60). If, however, you want to define more than one character, you put the number of the first one in the first position and the last one in the second position. For example, to redefine all the capital letters the command would be as follows because 65 is the ASCII code for capital A and 90 is the code for capital Z.

```
LPRINT CHR$(27) "&" CHR$(0) CHR$(65) CHR$(90);
```

The CHR\$(0) tells the printer which RAM area to use, but since an unmodified printer has only one area, always use CHR\$(0) there.

The above method works for the standard printable characters (codes 33 to 126 and 161 to 254). If you need to redefine more characters, you can use ESCape codes to allow you to define and print certain control codes in the same way that you treat other characters.

The ESCape "6" command changes codes 128 through 159 and 255 to printable characters, and ESCape "7" returns these codes to their normal functions. In the same manner, ESCape "I1" changes the following codes into printable characters: 0-6, 16-17, 21-26, 28-31, 128-134, 144-145, 149-154, 156-159. ESCape "I0" returns these codes to their normal functions.

## **Data numbers for user-defined characters**

Each user-defined character requires 12 data numbers. The first one should be 128 if the character uses the top eight pins and 0 if it uses the bottom eight pins. The other 11 numbers specify the dot patterns, using the same pin numbering system that is used for printing dot graphics. As you may have noticed, the program on page 108 always uses zero for the last two numbers (line 220).

## **WIDTH statements**

Defining many characters may use so much data that your computer system interferes with your character definition by inserting carriage return and line feed codes. To avoid this problem use a WIDTH statement, such as the one below, in any program that defines more than two or three characters:

```
WIDTH "LPT1:",255
```

The format for this statement may be different for your system. Consult your software manuals.



# Appendix D

## Maintenance

To keep your FX-286 working like new, always keep it in a safe and clean place. Keep it away from dust, grease, and any heat sources. A safe temperature range is 41°F to 95°F.

To clean the outside of the printer case, use a soft, clean cloth dampened with clear water. Stubborn stains can be removed with non-abrasive household cleaners.

The inside front portion of the printer should also be cleaned periodically to get rid of dust and paper lint. First, turn the power switch OFF and unplug the power cord from the electrical outlet. Then remove the dust cover.

Use a small vacuum cleaner and soft brush to clean inside the printer. Be careful not to bend or damage any of the parts inside the printer. With the power OFF, you can move the print head back and forth to clean under it.

Once in a great while your FX-286 should be lubricated by an authorized Epson dealer.

### Changing the Print Head

The expected life of an FX-286 print head is about 100 million characters (assuming an average of 14 dots per character). See your Epson dealer for replacements. If the print head fails suddenly or long before its estimated lifetime is over, the problem is probably in another component of the printer. Take the FX-286 to your dealer for service.

### Removing the old print head

Be sure the printer is off before you touch the print head. If you have been printing, wait about 15 minutes to allow the print head

to cool. Next, remove the dust cover and ribbon cartridge. Push the silver head-lock lever on the left side of the head away from you.

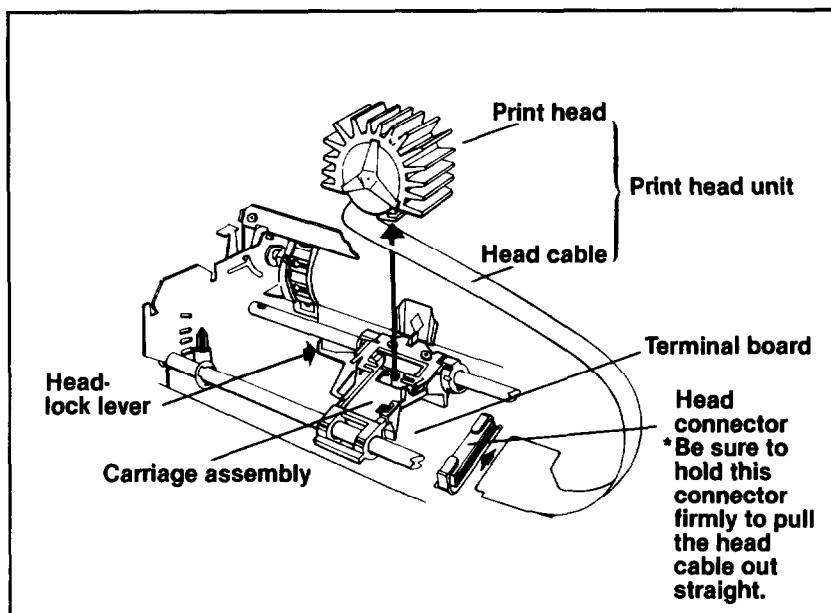


Figure D-1. Print head replacement

Push the carriage to the left end and disconnect the ribbon cable from the connector block (at the bottom of the printer mechanism, under the carriage) by pulling the heavy plastic tab just below the ribbon cable. Pull the print head straight up and off of the carriage.

### Installing the new print head

Place the new print head onto the head mount and flip the locking lever back toward the front of the printer. Connect the cable to the block. That's all there is to it!



# Appendix E

## The Parallel Interface

The FX-286 printers use a parallel interface to communicate with the computer; this appendix describes it.

Connector pin assignments and a description of respective interface signals are shown in Table E-1.

**Table E-1. Pins and signals**

Signal Pin	Return Pin	Signal	Direction	Description
1	19	STROBE	IN	STROBE pulse to read data in. Pulse width must be more than 0.5 microseconds at the receiving terminal.
2	20	DATA 1	IN	These signals represent information of the 1st to 8th bits of parallel data, respectively Each signal is at HIGH level when data is logical 1 and LOW when it is logical 0.
3	21	DATA 2	IN	
4	22	DATA 3	IN	
5	23	DATA 4	IN	
6	24	DATA 5	IN	
7	25	DATA 6	IN	
8	26	DATA 7	IN	
9	27	DATA 8	IN	
10	28	ACKNLG	OUT	Approximately, 12-microsecond pulse. LOW indicates that data has been received and that the printer is ready to accept more data.
11	29	BUSY	OUT	A HIGH signal indicates that the printer cannot receive data. The signal goes HIGH in the following cases: 1) During data entry (ea. char. time) 2) During printing 3) When Off Line 4) During printer-error state
12	30	PE	OUT	A HIGH signal indicates that the printer is out of paper.

Table E-1, continued

Signal Pin	Return Pin	Signal	Direction	Description
13	—	SLCT	OUT	Pulled up to + 5 volts through 3.3K ohm resistance.
14	—	AUTO FEED XT	IN	When this signal is LOW, the paper is automatically fed 1 line after printing. The signal level can be fixed to this by setting DIP switch 2-4 to ON.)
15	—	NC	—	Unused.
16	—	OV	—	Logic ground level.
17	—	CHASSIS GND	—	Printer's chassis ground, which is isolated from the logic ground.
18	—	NC	—	Unused.
19 - 30	—	GND	—	Twisted-pair return signal ground level.
31	—	INIT	IN	When this level becomes LOW, the printer controller is reset to its power-up state and the print buffer is cleared. This level is usually HIGH; its pulse width must be more than 50 microseconds at the receiving terminal.
32	—	ERROR	OUT	This level becomes LOW when the printer is in: 1) Paper-end state. 2) Off line. 3) Error state.
33	—	GND	—	Same as for Pins 19 - 30.
34	—	NC	—	Unused.
35	—	—	—	Pulled up to + 5V through 3.3K ohm resistance.
36	—	SLCT IN	IN	The DC1/DC3 code is valid only when this signal is "HIGH". (Internal fixing can be carried out with DIP switch pin 2-1. The level of this signal is factory-set to "LOW".)

Notes:

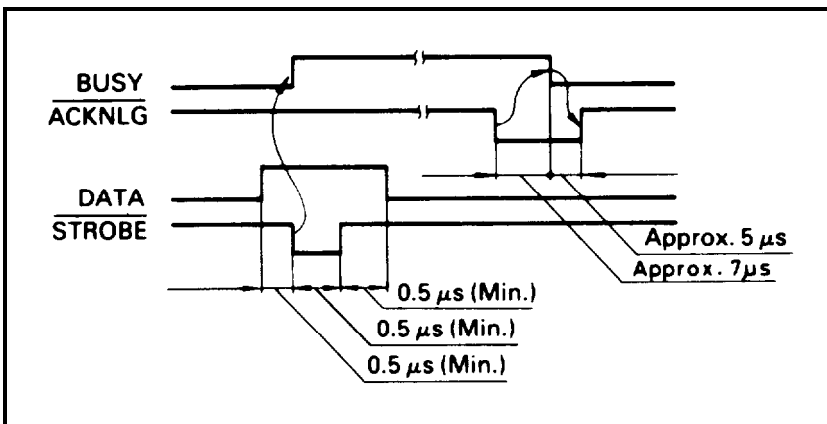
1. The column heading "Direction" refers to the direction of signal flow as viewed from the printer.
2. "Return" denotes the twisted-pair return, to be connected at signal ground level. For the interface wiring, be sure to use a twisted-pair cable for each signal and to complete the connection on the return side. To prevent noise, these cables should be shielded and connected to the chassis of the host computer or the printer but not at both ends.
3. All interface conditions are based on TTL level. Both the rise and the fall times of each signal must be less than 0.2 microseconds.

4. Data transfer must be carried out by observing the ACKNLG or BUSY signal. (Data transfer to this printer can be carried out only after receipt of the ACKNLG signal or when the level of the BUSY signal is LOW.)
5. Under normal conditions, printer cable pins 11, 12, and 32 are activated when the paper-out condition is detected. The ESCape"8" code disables pins 11 and 32, but not pin 12. Those computers that monitor pin 12 halt printing when the paper is out, making ESCape"8" ineffective.

## Data Transfer Sequence

### Interface timing

Figure E-1 shows the timing for the parallel interface.



**Figure E-1. Parallel interface timing**

### Printing enabled/disabled signals and control conditions

Table E-2 shows the relationship between printing being enabled or disabled, and the on-line/off-line condition, the printer select signal (SLCT IN), and the receipt of data on/off control character, DC1/DC3.

**Table E-2.**  
**Printing enabled/disabled signals and control conditions**

(Indicator on)	<b>SLCT IN</b>	<b>DC1/DC3</b> (Data on/off contr.)	<b>ERROR</b>	<b>BUSY</b>	<b>ACKNLG</b>	<b>Printing</b> (Disabled/enabled)
ON LINE	LOW (Sw. 2-1/interface)	DC1/DC3 (no effect)	HIGH	HIGH/LOW	PULSE EA. CHAR.	ENABLED (normal cond.)
ON LINE	HIGH	DC1 RECV'D	HIGH	HIGH/LOW	PULSED EA. CHAR.	ENABLED
ON LINE	HIGH	DC3 RECV'D	HIGH	HIGH/LOW	PULSED EA. CHAR.	*DISABLED
OFF LINE	<b>HIGH/LOW</b> (no effect)	<b>DC1 / DC3</b> (no effect)	LOW	HIGH	NOT GENERATED	DISABLED

\*Even though printing is disabled, data characters are received and acknowledged, since the printer is looking for another DC1 character, which would allow it to resume printing.

# Appendix F

## Technical Specifications

### Printing

Printing method . . . . . Impact dot matrix

Printing speed . . . . . 200 characters per second per  
line in pica

Paper feed speed . . . . . 2.3 inches per second line feed

Printing direction . . . . . Bidirectional, logic seeking  
Unidirectional (left to right) in graphics  
mode

Character sets ..... Roman characters  
Italic characters  
Special international characters  
NLQ characters - roman  
IBM standard and alternate  
character sets

Buffer..... 8K

### Character sizes:

Mode	Width (inches)	Height (inches)
Pica	.083	.122
Pica Emphasized	.083	.122
Pica Double-width	.166	.122
Elite	.055	.122
Elite Double-width	.110	.122
Condensed	.041	.122
Condensed Double-width	.082	.122
Condensed Elite*	.041	.122
Super/Subscript		.063

\*In condensed elite the character size is the same as condensed but the space between the characters is reduced.

Line spacing ..... Default is 1 / 6 inch. Programmable in increments of 1 / 72 of an inch and 1 / 216 of an inch

**Characters per line:**

	<u>Maximum characters per line</u>
Pica	136
Pica double-width	68
Elite	163
Elite double-width	81
Condensed	233
Condensed elite	272
Condensed double-width	116

**Paper**

Number of copies ..... One original plus two carbon copies; total thickness not to exceed 0.012 inch (0.3 mm)

	<u>Paper width</u>	<u>Paper feed</u>
Pin-feed paper .....	4" to 16"	Tractor feed
Cut sheet .....	7.25 to 14.4"	Friction feed

**Printer**

Ribbon ..... Cartridge ribbon, black

Ribbon life expectancy .... 3 million characters

M T B F ..... 5 million lines (excluding print head life)

Print head life ..... 100 million characters

# Dimensions and weight

Height .....	5.9in.
Width (with paper feed knob) .....	24.3 in.
Depth .....	13.9 in.
Weight .....	23.8 lbs.
Power .....	120 VAC ± 10%
Power usage .....	70 volt-amperes maximum
Frequency .....	49.5 to 60.5 Hz

# Environment

Temperature .....	Operating 41°F to 95°F (5°C to 35°C) Storage -31°F to 158°F (-35°C to 70°C)
Humidity .....	Operating 10% to 80% (no condensation) Storage 5 % to 85% (no condensation)
Shock .....	Operating 1 G (less than 1 millisecond) Storage 2 G (less than 1 millisecond)
Vibration .....	Operating 0.25 G, 55Hz (maximum) Storage 0.50 G, 55Hz (maximum)
Insulation resistance .....	10 megaohms between AC power line and chassis
Dielectric strength .....	No trouble when 1 kilovolt (R.M.S.) 50 or 60 Hz is applied for more than 1 minute between AC power line and chassis

## Interface

Interface .....	Centronics® compatible, 8-bit parallel
Synchronization .....	By externally supplied $\overline{\text{STROBE}}$ pulses
Handshaking.....	By $\overline{\text{ACKNLG}}$ or BUSY signals
Logic level .....	Input data and all interface control signals are compatible with the TTL level



# Appendix G

## **Epson Mode Command Summary**

This appendix describes the standard Epson commands first in numerical order for easy reference, and then in detail. The individual command descriptions are divided in the following way:

- Near Letter Quality
- Character Width
- Print Enhancement
- Page Formatting
- Word Processing
- Graphics
- User-Defined Characters
- MSB Control
- Other Codes

You should consult this section if you're using the Epson mode, or the IBM Proprinter section if you're using the IBM Proprinter mode. If a command functions in the same way in both modes, it is described in both sections. If a command is available in only one mode or if it has a different function in the other mode, the comments indicate either Epson only or IBM only.

Each command has a format section and a comment section. The format section gives the ASCII, decimal, and hexadecimal codes for the command. In some cases there is also a control key code because some commercial software programs can use a control key for a code between 0 and 27 (decimal). In this section, CTRL 0, for example, means hold down the control key while you press 0.

Letters in parentheses, such as (n) or (d), are variables, which are explained in the comments sections.

In BASIC you can use either decimal or hexadecimal numbers, and if there is a single letter in the second ASCII code column, you can use that letter in quotation marks instead of the number below it. For example, the format section for the right margin command is as follows:

ASCII code:	<b>ESC</b>	<b>Q</b>	<b>(n)</b>
Decimal :	<b>27</b>	<b>81</b>	<b>( n )</b>
Hexadecimal:	<b>1B</b>	<b>51</b>	<b>(n)</b>

In BASIC you can send the command to set the right margin to 60 in three ways:

```
Decimal:          LPRINT CHR$(27) CHR$(81) CHR$(60)
Hex:              LPRINT CHR$(&H1B) CHR$(&H51) CHR$(&H3C)
Decimal with quotes: LPRINT CHR$(27) "Q" CHR$(60)
```

ESCAPE sequences that require a 0 or 1 with a letter, such as ESC "W1" to turn on double-width, can use either the ASCII code or the numeral in quotation marks for the 0 or 1. For example, in BASIC you can turn on double-width with either of the formats below:

```
LPRINT CHR$(27) "W1" or LPRINT CHR$(27)"W"CHR$(1)
```

## Software Commands in Numerical Order

The following list shows the control codes and ESC sequences that the FX-286 uses along with their decimal values. For further details on their use, consult the index to find out where they are discussed in detail. The number on the right after each name is the page where the command is described.

7	BEL	Beeper . . . . .	G-30
8	BS	Backspace . . . . .	G-30
9	HT	Tab Horizontally . . . . .	G-19
10	LF	Line Feed . . . . .	G-15
11	VT	Tab Vertically . . . . .	G-20
12	FF	Form Feed . . . . .	G-18
13	CR	Carriage Return . . . . .	G-31

<b>14</b>	<b>SO</b>	Select Double-width Mode (one line) . .	<b>G-8</b>
<b>15</b>	<b>SI</b>	Select Condensed Mode . . . . .	<b>G-7</b>
<b>17</b>	<b>DC1</b>	Select Printer . . . . .	G-31
<b>18</b>	<b>DC2</b>	Cancel Condensed Mode . . . . .	G-8
<b>19</b>	<b>DC3</b>	Deselect Printer . . . . .	G-31
<b>20</b>	<b>DC4</b>	Cancel Double-width Mode (one line) .	<b>G-9</b>
<b>24</b>	<b>CAN</b>	Cancel Line . . . . .	G-32
<b>127</b>	<b>DEL</b>	Delete Character . . . . .	<b>G-34</b>
ESC <b>14</b>	ESC <b>SO</b>	Select Double-width Mode (one line) . .	G-8
ESC <b>15</b>	ESC <b>SI</b>	Select Condensed Mode . . . . .	<b>G-7</b>
ESC <b>25</b>	ESC <b>EM</b>	Cut Sheet Feeder Control . . . . .	G-32
ESC <b>32</b>	ESC <b>SP</b>	Select Character Space . . . . .	<b>G-22</b>
ESC <b>33</b>	ESC <b>!</b>	Master Select . . . . .	G-12
ESC <b>35</b>	ESC <b>#</b>	MSB Control Sequence Cancel . . . . .	G-29
ESC <b>36</b>	ESC <b>\$</b>	Select Absolute Dot Position . . . . .	G-22
ESC <b>37</b>	ESC <b>%</b>	Select User-defined Set . . . . .	G-27
ESC <b>38</b>	ESC <b>&amp;</b>	Define User-defined Characters . . . . .	<b>G-27</b>
ESC <b>42</b>	ESC <b>*</b>	Select Graphics Mode . . . . .	G-26
ESC <b>45</b>	ESC <b>-</b>	Select/Cancel Underlining . . . . .	G-12
ESC <b>47</b>	ESC <b>/</b>	Select Vertical Tab Channel . . . . .	G-21
ESC <b>48</b>	ESC <b>0</b>	Select 1/8-inch Line Spacing . . . . .	G-16
ESC <b>49</b>	ESC <b>1</b>	Select 7/72-inch Line Spacing . . . . .	G-16
ESC <b>50</b>	ESC <b>2</b>	Select 1/6-inch Line Spacing . . . . .	G-16
ESC <b>51</b>	ESC <b>3</b>	Select n/216-inch Line Spacing . . . . .	G-17
ESC <b>52</b>	ESC <b>4</b>	Select Italic Mode . . . . .	G-13
ESC <b>53</b>	ESC <b>5</b>	Cancel Italic Mode . . . . .	G-13
ESC <b>54</b>	ESC <b>6</b>	Printable Code Area Expansion . . . . .	G-28
ESC <b>55</b>	ESC <b>7</b>	Cancel ESC 6 . . . . .	G-28
ESC <b>56</b>	ESC <b>8</b>	Disable Paper-out Sensor . . . . .	G-32
ESC <b>57</b>	ESC <b>9</b>	Enable Paper-out Sensor . . . . .	G-33
ESC <b>58</b>	ESC <b>:</b>	Copy ROM Into RAM . . . . .	G-27
ESC <b>60</b>	ESC <b>&lt;</b>	Select Unidirectional Mode . . . . .	G-33
ESC <b>61</b>	ESC <b>=</b>	MSB = 0 Setting . . . . .	G-29
ESC <b>62</b>	ESC <b>&gt;</b>	MSB = 1 Setting . . . . .	G-30
ESC <b>63</b>	ESC <b>?</b>	Reassign Graphics Mode . . . . .	G-26
ESC <b>64</b>	ESC <b>@</b>	Initialize Printer . . . . .	G-33
ESC <b>65</b>	ESC <b>A</b>	Select n/72-inch Line Spacing . . . . .	G-17
ESC <b>66</b>	ESC <b>B</b>	Select Vertical Tabs . . . . .	G-20
ESC <b>67</b>	ESC <b>C</b>	Select Page Length in Lines . . . . .	G-18
ESC <b>67</b>	ESC <b>CO</b>	Select Page Length in Inches . . . . .	G-19
ESC <b>68</b>	ESC <b>D</b>	Set Horizontal Tabs . . . . .	G-19

ESC 69	ESC E	Select Emphasized Mode .....	G-10
ESC 70	ESC F	Cancel Emphasized Print .....	G-10
ESC 71	ESC G	Select Double-strike Mode .....	G-11
ESC 72	ESC H	Cancel Double-strike Mode .....	G-11
ESC 73	ESC I	Printable Code Area Expansion .....	G-29
ESC 74	ESC J	Immediate n/216-inch Line Feed .....	G-17
ESC 75	ESC K	Single-density Graphics Mode .....	G-24
ESC 76	ESC L	Double-density Graphics Mode .....	G-24
ESC 77	ESC M	Select Elite Width .....	G-9
ESC 78	ESC N	Select Skip-over-perforation .....	G-15
ESC 79	ESC O	Cancel Skip-over-perforation .....	G-15
ESC 80	ESC P	Select Pica Width .....	G-10
ESC 81	ESC Q	Set Right Margin .....	G-14
ESC 82	ESC R	International Character Set .....	G-13
ESC 83	ESC S O	Select Superscript .....	G-11
ESC 83	ESC S 1	Select Subscript .....	G-11
ESC 84	ESC T	Cancel Superscript/Subscript .....	G-12
ESC 85	ESC U	Select Unidirectional Mode .....	G-34
ESC 87	ESC W	Select/Cancel Double-width Mode ....	G-9
ESC 89	ESC Y	High-Speed Double-density Graphics ..	G-25
ESC 90	ESC Z	Quadruple-density Graphics .....	G-25
ESC 92	ESC \	Select Relative Dot Position .....	G-23
ESC 94	ESC ^	Select Nine-pin Graphics Mode .....	G-26
ESC 97	ESC a	NLQ Justification .....	G-23
ESC 98	ESC b	Select Vertical Tabs in Channels .....	G-20
ESC 106	ESC j	Reverse Line Feed .....	G-18
ESC 108	ESC l	Set Left Margin .....	G-14
ESC 112	ESC p	Select/Cancel Proportional Mode ....	G-21
ESC 115	ESC s	Select Half-speed Mode .....	G-34
ESC 120	ESC x	Select NLQ or draft .....	G-7

## **Epson Mode Commands**



# Near Letter Quality Mode

ESC x

Select NLQ or draft

Format:

ASCII code:	ESC		(n)
Decimal:	27	120	( n )
Hexadecimal:	1B	78	(n)

Comments:

- n = 0 selects draft mode
- n = 1 selects Near Letter Quality (NLQ) mode
- Epson only.

# Character Width

SI

Select Condensed Mode

Format:

ASCII code:	SG
Decimal:	15
Hexadecimal:	0 F
Control:	CTRL O

Comments:

Condensed mode has 17.16 characters per inch. Not available in NLQ.

ESC SI

Select Condensed Mode

Format:

ASCII code:	ESC	SG
Decimal:	27	15
Hexadecimal:	1 B	0F

Comments:

Duplicates the SI command.

## **DC2**

## **Cancel Condensed Mode**

---

### **Format:**

ASCII code: DC2  
Decimal : 18  
Hexadecimal: 12  
Control: CTRL R

### **Comments:**

Cancels condensed printing set by SI or ESC SI.

## **SO**

## **Select Double-width Mode (one line)**

---

### **Format:**

ASCII code: S O  
Decimal: 14  
Hexadecimal: 0 E  
Control: CTRL N

### **Comments:**

Doubles the width of all characters. It can be cancelled by a carriage return, DC4, ESC W0 or ESC !.

## **ESC SO**

## **Select Double-width Mode (one line)**

---

### **Format:**

ASCII code:	ESC	SO
Decimal:	27	14
Hexadecimal:	1 B	0E

### **Comments:**

Duplicates the SO command.



**DC4****Cancel Double-width Mode (one line)**

---

**Format:**

ASCII code: DC4  
Decimal : 20  
Hexadecimal: 14  
Control: CTRL T

**Comments:**

Cancels one-line double-width printing selected by SO or ESC SO, but not double-width printing set by ESC W or **ESC !**.

**ESC W****Select/Cancel Double-width Mode**

---

**Format:**

ASCII code:	ESC	W	(n)
Decimal:	27	87	(n)
Hexadecimal:	1B	57	(n)

**Comments:**

Double-width mode doubles the width of all characters.

n = 1 selects the mode

n = 0 cancels it

**ESC M****Select Elite Width**

---

**Format:**

ASCII code:	ESC	M
Decimal:	27	77
Hexadecimal:	1B	4D

**Comments:**

Elite width has 12 characters per inch. Not available in NLQ.

- Epson only.

## ESC P

## Select Pica Width

### Format:

ASCII code:	ESC	P
Decimal:	27	80
Hexadecimal:	1B	50

### Comments:

Selects pica width (10 characters per inch). **Because pica** is the default character width, this command is normally used to cancel elite width.

- Epson only.

## Print Enhancement

## ESC E

## Select Emphasized Mode

### Format:

ASCII code:	ESC	E
Decimal :	27	69
Hexadecimal:	1B	45

### Comments:

In emphasized each dot is printed twice, with the second dot slightly to the right of the first. Reduces print head speed.

Valid only in pica mode.

## ESC F

## Cancel Emphasized Mode

### Format:

ASCII code:	ESC	F
Decimal :	27	70
Hexadecimal:	1B	46

### Comments:

Turns off the mode selected by ESC E.

**ESC G****Select Double-strike Mode****Format:**

ASCII code:	ESC	G
Decimal :	27	71
Hexadecimal:	1B	47

**Comments:**

In double-strike each line is printed twice, with the second printing slightly below the first. Not valid in NLQ mode.

**ESC H****Cancel Double-strike Mode****Format:**

ASCII code:	ESC	H
Decimal:	27	72
Hexadecimal:	1B	48

**Comments:**

Turns off the mode selected by ESC G.

**ESC S0****Select Superscript****Format:**

ASCII code:	ESC	S	0
Decimal:	27	83	0
Hexadecimal:	1B	53	0

**Comments:**

Selects superscript mode.

**ESC S1****Select Subscript****Format:**

ASCII code:	ESC	S	1
Decimal :	27	83	1
Hexadecimal:	1B	53	1

**Comments:**

Selects subscript mode.

**ESC T****Cancel Superscript/Subscript****Format:**

ASCII code:	ESC	T
Decimal :	27	84
Hexadecimal:	1B	54

**Comments:**

Cancels either mode.

**ESC -****Select/Cancel Underlining****Format:**

ASCII code:	ESC	-	(n)
Decimal :	27	45	(n)
Hexadecimal:	1B	2D	( n )

**Comments:**

**n** = 1 selects underlining  
**n** = 0 cancels it.

**ESC !****Master Select****Format:**

ASCII code:	ESC	!	(n)
Decimal:	27	33	(n)
Hexadecimal:	1B	21	( n )

**Comments:**

Selects any valid combination of the following modes: pica, elite, proportional, condensed, emphasized, double-strike, double-width, italic, underline. Elite, proportional, condensed, double-strike, and italic are not available in NLQ. Further details in Chapter 5.

- Epson only.

## ESC 4

## Select Italic Mode

### Format:

ASCII code:	ESC	4
Decimal:	27	52
Hexadecimal:	1B	<b>34</b>

### Comments:

Causes characters to be printed in the italic character set.

Not valid in NLQ.

- Epson only

## ESC 5

## Cancel Italic Mode

### Format:

ASCII code:	ESC	5
Decimal :	27	53
Hexadecimal:	1 B	<b>35</b>

### Comments:

Cancels the mode selected by ESC 4 .

- Epson only.

## ESC R

## Select an International Character Set

### Format:

ASCII code:	ESC	R	(n)
Decimal:	<b>27</b>	82	( <b>n</b> )
Hexadecimal:	1B	<b>52</b>	( <b>n</b> )

### Comments:

See Chapter 5 for details on this command.

- Epson only.

# Page Formatting

## Margins

### ESC Q

### Set Right Margin

#### Format:

ASCII code:	ESC	Q	(n)
Decimal:	27	81	( n )
Hexadecimal:	1 B	51	(n)

#### Comments:

Sets the right margin. Also cancels all text in the print buffer.

The range of n is shown below:

2-136 in pica

3-163 in elite

4-233 in condensed

4-272 in condensed elite

- Epson only.

### ESC I

### Set Left Margin

#### Format:

ASCII code:	ESC	I	(n)
Decimal:	27	108	( n )
Hexadecimal:	1 B	6C	(n)

#### Comments:

Sets the left margin.

n = first printing column in the current width

Maximum value of n is:

134 in pica

160 in elite

229 in condensed

270 in condensed elite

Clears previous tab settings; therefore should be set before tabs are set. Use lowercase i, not the numeral one.

- Epson only.

---

<b>ESC N</b>	<b>Select Skip-over-perforation</b>
--------------	-------------------------------------

---

**Format:**

ASCII code:	ESC	N	(n)
Decimal:	27	78	(n)
Hexadecimal:	1B	4E	(n)

**Comments:**

The variable n is the number of lines skipped between the last line printed on one page and the first line on the next page. For example, with the standard settings for line spacing and page length (66 lines) ESC N 6 will cause the FX-286 to print 60 lines and then skip six. DIP switch 2-3 and SelecType mode 10 perform the same function.

---

<b>ESC O</b>	<b>Cancel Skip-over-perforation</b>
--------------	-------------------------------------

---

**Format:**

ASCII code:	ESC	0
Decimal:	27	79
Hexadecimal:	1B	4F

**Comments:**

Cancels the mode selected by ESC N.

**Line spacing**

---

<b>LF</b>	<b>Line Feed</b>
-----------	------------------

---

**Format:**

ASCII code:	LF
Decimal:	10
Hexadecimal:	0A
Control:	CTRL J

**Comments:**

**When** this command is received, the data in the print buffer is printed and the paper advances one line in the current line spacing.

## **ESC 0**

## **Select 1/8-inch Line Spacing**

### **Format:**

<b>ASCII code:</b>	<b>ESC</b>	<b>0</b>
Decimal:	27	48
Hexadecimal:	1 B	30

### **Comments:**

Sets the line spacing to 1/8 of an inch for subsequent line feed commands. The "0" is the digit zero and not ASCII code 0.

## **ESC 1**

## **Select 7/72-inch Line Spacing**

### **Format:**

<b>ASCII code:</b>	<b>ESC</b>	<b>1</b>
Decimal :	27	49
Hexadecimal:	1 B	31

### **Comments:**

Sets the line spacing to 7/72 of an inch for subsequent line feed commands. The "1" is the digit one and not lower case L or ASCII code 1.

## **ESC 2**

## **Select 1/6-inch Line Spacing**

### **Format:**

<b>ASCII code:</b>	<b>ESC</b>	<b>2</b>
Decimal:	27	50
Hexadecimal:	1 B	32

### **Comments:**

Sets the line spacing to 1/6 of an inch for subsequent line feed commands. The "2" is the digit two and not ASCII code 2. This is the default at power on.

- Epson only.



**ESC 3****Select n/216-inch Line Spacing****Format:**

ASCII code:	ESC	3	(n)
Decimal:	27	51	(n)
Hexadecimal:	1B	33	(n)

**Comments:**

Sets the line spacing to n/216 of an inch for subsequent line feed commands. The “3” is the digit three and not ASCII code 3. The value of n should be in the range 0 to 255.

**ESC J****Immediate n/216-inch Line Feed****Format:**

ASCII code:	ESC	J	(n)
Decimal:	27	74	(n)
Hexadecimal:	1B	4A	(n)

**Comments:**

Advances the paper by one line at a spacing of n/216 of an inch. The value of n should be in the range 0 to 255. This produces an immediate line feed but does not affect subsequent line spacing and does not produce a carriage return.

**ESC A****Select n/72-inch Line Spacing****Format:**

ASCII code:	ESC	A	(n)
Decimal:	27	65	(n)
Hexadecimal:	1B	41	(n)

**Comments:**

**Sets** the line spacing to n/72 of an inch for subsequent line feed commands. The value of n should be in the range 0 to **85**.

- Epson only.

## ESC j

## Reverse Line Feed

### Format:

ASCII code:	ESC	j	(n)
Decimal:	27	106	(n)
Hexadecimal:	1B	6A	(n)

### Comments:

Executes reverse line feed. Line spacing of  $n/216$ ths of an inch is executed in the reverse direction after the data in the print buffer has been printed.

$n$  = line spacing in  $1/216$ th of an inch.

The accuracy of paper feed is guaranteed up to  $n = 18$ .

- Epson only.

**Note:** Can only be used with single-sheet paper, not with the tractor unit.

## Form feed and page length

### FF

### FF

### Format:

ASCII code:	FF
Decimal:	12
Hexadecimal:	0C
Control:	CTRL L

### Comments:

Prints the data in the print buffer and advances the paper to the top of the next page according to the current page length.

## ESC C

## Select Page Length in Lines

### Format:

ASCII code:	ESC	C	(n)
Decimal:	27	67	(n)
Hexadecimal:	1B	43	(n)

### Comments:

Sets the page length to  $n$  lines. The value of  $n$  should be between 1 and 127.

## ESC C0

## Select Page Length in Inches

### Format:

ASCII code:	ESC	C	0	(n)
Decimal:	27	67	0	(n)
Hexadecimal:	1B	43	00	(n)

### Comments:

Sets the page length to n inches where n has a value of 1 to 22.

## Tabs

## HT

## Tab Horizontally

### Format:

ASCII code:	H T
Decimal:	9
Hexadecimal:	09
Control:	CTRL G

### Comments:

Advances the print position to the next horizontal tab setting.

## ESC D

## Set Horizontal Tabs

### Format:

ASCII code:	ESC	D	(n1)	(n2)	...	0
Decimal:	27	68	(n1)	(n2)	...	0
Hexadecimal:	1B	44	(n1)	(n2)	...	00

### Comments:

This command allows setting of up to 32 horizontal tabs. These are entered **as** n1, n2, n3 etc. (in the range 1 to 255) with ASCII 0 as the terminator. The tab settings n1, n2, n3 etc. must be entered in ascending order. If n1 = 0, all tabs are cleared. The settings are every eight characters on power up or after an ESC @ command.

VT

Tab Vertically

**Format:**  
ASCII code: VT  
Decimal: 11  
Hexadecimal: 0B  
Control: CTRL K

**Comments:**  
Advances the paper to the next tab setting in the channel selected by ESC /. If no channel has been selected, channel 0 is used. If no vertical tabs have been selected, the paper advances one line.

ESC B

Select Vertical Tabs

**Format:**  
ASCII code: ESC B (n1) (n2) ... 0  
Decimal: 27 66 (n1) (n2) ... 0  
Hexadecimal: 1B 42 (n1) (n2) ... 00

**Comments:**  
**Sets** up to 16 vertical tabs in the current line spacing. Tab settings are not affected by subsequent changes in line spacing. Terminate this tab sequence with 0 or a number less than that of the last tab.

ESC b

Select Vertical Tabs in Channels

**Format:**  
ASCII code: ESC b (c) (n1) (n2) ... 0  
Decimal: 27 98 (c) (n1) (n2) ... 0  
Hexadecimal: 1B 62 (c) (n1) (n2) ... 00

**Comments:**  
c = 0 to 7  
Sets up to 16 vertical tabs for channel c.  
The tab settings can be cleared by giving a value of zero to n1.  
Tab settings are not affected by subsequent changes in line spacing.

- Epson only.

**ESC /****Select Vertical Tab Channel****Format:**

ASCII code:	ESC	/	(c)
Decimal :	27	47	(c)
Hexadecimal:	1B	2F	(c)

**Comments:**

This command is used to select the vertical tab channel, where c has the value 0 to 7 .

- Epson only.

**Word Processing****ESC p****Select/Cancel Proportional Mode****Format:**

ASCII code:	ESC	p	(n)
Decimal:	27	112	( n )
Hexadecimal:	1B	70	(n)

**Comments:**

Selects or cancels proportional printing mode.

n = 1 selects

n = 0 cancels

This command is valid only in draft mode. See Chapter 5 for further details and Appendix I for proportional width tables.

- Epson only.

## ESC (space)

## Select Character Space

### Format:

ASCII code:	ESC	(space)	(n)
Decimal :	27	32	(n)
Hexadecimal:	1B	20	(n)

### Comments:

Determines the amount of space added to the right of each character, specified in dots (1/72 of an inch).

n = number of dots

n = 0 to 63 (MSB ignored).

NLQ only.

- Epson only.

## ESC \$

## Select Absolute Dot Position

### Format:

ASCII code:	ESC	\$	(n1)	(n2)
Decimal:	27	36	(n1)	(n2)
Hexadecimal:	1B	24	(n1)	(n2)

### Comments:

This sequence specifies the position from which subsequent characters are to be printed. The dot position is specified by n1 and n2; n1 is the lower byte of the dot position, and n2 is the higher byte. Specifying the dot position as 0 (specifying 0 for both n1 and n2) results in printing at the left margin; however, the sequence is ignored and the previous setting remains effective if the position specified is beyond the right margin. A dot is 1/60 inch.

n1 = 0 to 255

n2 = 0 to 3

NLQ only.

- Epson only.

**ESC \****Select Relative Dot Position****Format:**

ASCII code:	ESC	\	(n1)	(n2)
Decimal:	27	92	(n1)	(n2)
Hexadecimal:	1B	5C	(n1)	(n2)

**Comments:**

Determines the position at which printing of following data will start. The variables n1 and n2 specify the dot position, with the lower byte of the position specified as n1 and the upper byte specified as n2. Positive values move the print position to the right, and negative values move it to the left.

NLQ only.

- Epson only.

**ESC a****NLQ Justification****Format:**

ASCII code:	ESC		(n)
Decimal :	27	97	(n)
Hexadecimal:	1B	61	( n )

**Comments:**

This sequence selects justification as follows:

- n = 0: Selects left justification
- n = 1: Selects centering
- n = 2: Selects right justification
- n = 3: Selects full justification

The default setting is n = 0.

Full justification (n = 3) is performed when the buffer becomes full.

HT and BS are invalid except in n = 0 mode.

For n = 3 a WIDTH statement may be required.

For n = 3 there should be no carriage returns within a paragraph.

NLQ only.

- Epson only.

# Graphics

**Note:** See Chapter 6 for sample graphics programs.

## **ESC K** **Select Single-density Graphics Mode**

---

**Format:**

ASCII code:	ESC	K	(n1)	(n2)
Decimal:	27	75	(n1)	(n2)
Hexadecimal:	1B	4B	(n1)	(n2)

**Comments:**

Turns on single-density graphics mode with 480 possible dots per eight-inch line and 816 per 13.6-inch line.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

## **ESC L** **Select Double-density Graphics Mode**

---

**Format:**

ASCII code:	ESC	L	(n1)	(n2)
Decimal :	27	76	(n1)	(n2)
Hexadecimal:	1B	4C	(n1)	(n2)

**Comments:**

Turns on low-speed double-density graphics mode with 960 possible dots per eight-inch line and 1632 per 13.6-inch line.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.



## **ESC Y            Select High-speed Doubledensity Graphics Mode**

---

**Format:**

ASCII code:	<b>ESC</b>	<b>Y</b>	<b>(n1)</b>	<b>(n2)</b>
Decimal:	<b>27</b>	<b>89</b>	<b>(n1)</b>	<b>(n2)</b>
Hexadecimal:	<b>1 B</b>	<b>59</b>	<b>(n1)</b>	<b>(n2)</b>

**Comments:**

Turns on high-speed double-density graphics mode with 960 possible dot positions per eight-inch line and 1632 per 13.6-inch line. Will not print consecutive dots in a row.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

## **ESC Z            Select Quadruple-density Graphics Mode**

---

**Format:**

ASCII code:	<b>ESC</b>	<b>Z</b>	<b>(n1)</b>	<b>(n2)</b>
Decimal:	<b>27</b>	<b>90</b>	<b>(n1)</b>	<b>(n2)</b>
Hexadecimal:	<b>1 B</b>	<b>5A</b>	<b>(n1)</b>	<b>(n2)</b>

**Comments:**

Turns on quadruple-density graphics mode with 1920 possible dot positions per eight-inch line and 3264 per 13.6-inch line. Will not print consecutive dots in a row.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

ESC \*

Select Graphics Mode

Format:

ASCII code:	ESC	*	(m)	(n1)	(n2)
Decimal:	27	42	(m)	(n1)	(n2)
Hexadecimal:	1B	2A	(m)	(n1)	(n2)

Comments:

Turns on graphics mode m. See Chapter 6 for details on the seven modes available.

If d is the total number of dots required,

$n1 = d \text{MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

- Epson only.

ESC ?

Reassign Graphics Mode

Format:

ASCII code:	ESC	?	(s)	(n)
Decimal:	27	63	(s)	(n)
Hexadecimal:	1B	3F	(s)	(n)

Comments:

Changes **one** graphics mode to another. The variable s is a character K, L, Y or Z, which **is** reassigned to a mode 0–6.

- Epson only.

ESC ^

Select Nine-pin Graphics Mode

Format:

ASCII code:	ESC	^	(m)	(n1)	(n2)
Decimal :	27	94	(m)	(n1)	(n2)
Hexadecimal:	1B	5E	(m)	(n1)	(n2)

Comments:

Turns on nine-pin graphics mode. Where m defines density of print ( 0 for single and 1 for double) and d is the total number of dots required n1 and n2 are as below:

$n1 = d \text{MOD } 256 \text{ and } n2 = \text{INT}(d / 256)$

and are followed by two times d data bytes. The printer expects two data items for each column of print.

- Epson only.

## User-defined Characters

Note: See Chapter 7 for sample programs and further information.

The commands are available in the draft mode only.

### **ESC & Define User-defined Characters**

#### **Format:**

ASCII code:	ESC	&	NUL	(d1)	(d2)	...	(dn)
Decimal:	27	38	0	(d1)	(d2)	...	(dn)
Hexadecimal:	1B	26	00	(d1)	(d2)	...	(dn)

#### **Comments:**

This command allows characters to be redefined in the currently selected mode.

- Epson only

### **ESC : Copy ROM Into RAM**

#### **Format:**

ASCII code:	ESC	:	0	0	0
Decimal:	27	58	0	0	0
Hexadecimal :	1B	3A	00	00	00

#### **Comments:**

This code allows the characters in the FX-286 ROM to be copied into RAM so that specific characters can be redefined.

- Epson only.

### **ESC % Select User-defined Set**

#### **Format:**

ASCII code:	ESC	%	(n)
Decimal:	27	37	(n)
Hexadecimal:	1B	25	(n)

#### **Comments:**

This code selects the user-defined set if n = 1 and the normal set if n = 0. ESC & is required to define the character set.

- Epson only.

## ESC 6

## Printable Code Area Expansion

---

### Format:

ASCII code:	ESC	6
Decimal :	27	54
Hexadecimal:	1 B	36

### Comments:

ASCII codes 128 to 159 and 255 are usually not printable. These codes become printable upon input of the ESC 6 code, which allows the use of these codes for user-defined characters.

- Epson only.

## ESC 7

## Cancel ESC 6

---

### Format:

ASCII code:	ESC	7
Decimal:	27	55
Hexadecimal:	1 B	37

### Comments:

**Cancels** ESC 6 setting. Input of this code causes the printer to ignore all codes except control codes in ASCII codes 128 to 159, and 255. This is the default setting.

- Epson only.

## ESC I

## Printable Code Area Expansion

### Format:

ASCII code:	ESC	I	(n)
Decimal:	27	73	(n)
Hexadecimal:	1B	49	(n)

### Comments:

ASCII codes 0 to **31** and 128 to 159 are usually not printable. These codes become printable upon input of the ESC I code if  $n = 1$ , which allows the use of these codes for user-defined characters.

If  $n = 0$ , 0 to 31 and 128 to 159 return to non-printable codes.

- Epson only.

## MSB Control

**Note:** MSB control does not work for graphics data.

## ESC #

## MSB Control Sequence Cancel

### Format:

ASCII code:	ESC	#
Decimal :	27	35
Hexadecimal :	1B	23

### Comments:

Cancels the MSB control set by ESC = or ESC >.

- Epson only.

**Note:** MSB control does not work for graphics data.

## ESC = (equal)

## MSB = 0 Setting

### Format:

ASCII code:	ESC	
Decimal:	27	61
Hexadecimal:	1B	3D

### Comments:

Selects MSB as 0. When this code is input, the MSB of an eight-bit data input after this code becomes 0.

- Epson only.

## **ESC >**

## **MSB = 1 Setting**

### **Format:**

ASCII code:   ESC           >  
Decimal:       27           62  
Hexadecimal: 1B           3E

### **Comments:**

Selects MSB as 1 . When this code is input, the MSB of an eight-bit data input after this code becomes 1 .

- Epson only

## **Other Codes**

### **BEL**

### **Beeper**

#### **Format:**

ASCII code:   BEL  
Decimal:       7  
Hexadecimal: 07  
Control:       CTRL G

#### **Comments:**

Sounds the FX-286 beeper.

### **BS**

### **Backspace**

#### **Format:**

ASCII code: BS  
Decimal:       8  
Hexadecimal: 08  
Control:       CTRL H

#### **Comments:**

Prints out data in the print buffer, then moves the print position one space to the left. If this code is received immediately after graphics printing, the print position of subsequent data is moved back to the point at which graphics printing started.

**CR****Carriage Return**

---

**Format:**

ASCII code: CR  
Decimal: 13  
Hexadecimal: 0D  
Control : CTRL M

**Comments:**

Prints the data in the buffer and returns the print position to the left margin.

**DC1****Select Printer**

---

**Format:**

ASCII code: DC1  
Decimal: 17  
Hexadecimal: 11  
Control: CTRL Q

**Comments:**

Returns the printer to the on-line mode if it has been switched off by the printer deselect code, DC3. It will not switch the printer on-line if it has been switched off using the ON LINE switch on the control panel.

**DC3****Deselect Printer**

---

**Format:**

ASCII code: DC3  
Decimal : 19  
Hexadecimal: 13  
Control: CTRL S

**Comments:**

Places the printer in off-line mode until the select printer code DC1 is received.

- Epson only.

## CAN

## Cancel Line

### Format :

ASCII code:     **CAN**  
Decimal :         24  
Hexadecimal: **18**  
Control:         CTRL X

### Comments:

Removes all text in the print buffer, but does not affect control codes.

## ESC EM

## Cut Sheet Feeder Control

### Format:

ASCII code:	<b>ESC</b>	<b>EM</b>	<b>(n)</b>
Decimal:	27	25	(n)
Hexadecimal:	<b>1B</b>	<b>19</b>	<b>(n)</b>

### Comments:

Used with the optional cut-sheet feeder. When **n** = 0 the feeder is turned off, when **n** = 4 it is turned on. Using DIP switch 1–3 produces the same effect.

- Epson only.

## ESC 8

## Disable Paper-out Sensor

### Format:

ASCII code:	<b>ESC</b>	<b>8</b>
Decimal:	27	56
Hexadecimal:	<b>1B</b>	<b>38</b>

### Comments:

Turns off the paper-out sensor so that you can print to the end of a single sheet of paper. This command duplicates the function of DIP switch 1-2. Computer systems that monitor printer cable pin 12 will ignore both ESCape 8 and **the** setting of switch 1–2. If you have such a system and want to print on the bottom two inches of a sheet of paper, there are two solutions to this problem. Buy a computer cable designed to overcome the problem; or use longer paper as a backing sheet.



**ESC 9****Enable Paper-out Sensor**

---

**Format:**

ASCII code:	ESC	9
Decimal:	27	57
Hexadecimal:	1B	39

**Comments:**

Turns on paper-out sensor so that the printer beeper sounds and printing stops when the printer runs out of paper.

**ESC <****Select Unidirectional Mode (one line)**

---

**Format:**

ASCII code:	ESC	<
Decimal :	27	60
Hexadecimal:	1B	3C

**Comments:**

Selects unidirectional printing for more accurate positioning during text printing for one line only. It is cancelled by a carriage return.

- Epson only

**ESC @****Initialize Printer**

---

**Format:**

ASCII code:	ESC	@
Decimal:	27	64
Hexadecimal:	1B	40

**Comments:**

Resets the printer to the power-on state, including top of form. Clears the buffer of all data entered before the command but not after. Does not affect settings made with SelecType.

- Epson only.

## ESC U

## Select Unidirectional Mode

### Format:

ASCII code:	ESC	U	(n)
Decimal:	27	85	(n)
Hexadecimal:	1B	55	(n)

### Comments:

Selects unidirectional printing for more accurate positioning during text printing.

n = 1 selects the feature

n = 0 cancels it.

(Graphics printing is always unidirectional.)

## ESC s

## Select Half-speed Mode

### Format:

ASCII code:	ESC	S	(n)
Decimal:	27	115	(n)
Hexadecimal:	1B	73	(n)

### Comments:

n = 1 selects the mode

n = 0 cancels it.

- Epson only

## DEL

## Delete Character

### Format:

ASCII code:	DEL
Decimal:	127
Hexadecimal :	7F

### Comments:

Removes the last text character in the print buffer but does not affect control codes. It cannot be guaranteed in the italic mode. Not valid in NLQ.

- Epson only.

# Appendix H

## FX-286 **Character Fonts-Epson Mode**

This appendix shows the character fonts available on the FX-286 printer in the Epson mode. In order to present the character sets as clearly as possible, the tables in this appendix are arranged by hexadecimal numbers. There is also a hexadecimal to decimal conversion table for those who prefer to use decimal numbers.

See Chapter 5 for the international characters available in the Epson mode.

## How to Use the Charts

To determine **the** hexadecimal number that prints a particular character, find the character in one of the tables; then look at the top of its column and at the beginning of its row. The number at the top of the column is the first digit of the character's hex code, and the number at the beginning of the row is the second digit of the hex code.

For example, find the capital Z in the Epson Draft chart on the next page. At the top of its column is 5 and at the beginning of its row is A. Therefore the hex code for a capital Z is 5A.

## Converting hexadecimal numbers to decimal numbers

If you prefer to use decimal numbers instead of hexadecimal numbers, you can convert them with the chart below. Just read down in the column for the first digit of the hex number and across in the row for the second digit. Where the two intersect is the decimal number that corresponds to your hex number. For example, to find the decimal equivalent of hex 5A, look where column 5 intersects with row A. There you will find decimal 90.

***Hex-to-Decimal Conversion Chart***

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
1	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
2	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
3	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
4	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
5	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
6	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
7	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
8	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
9	9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
A	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
B	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
C	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
D	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
E	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
F	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

### *Epson Draft Mode*

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	'	p				0	@	P	'	p	
1		!	1	A	Q	a	q				/	1	A	Q	a	q
2		"	2	B	R	b	r				"	2	B	R	b	r
3		#	3	C	S	c	s				#	3	C	S	c	s
4		\$	4	D	T	d	t				\$	4	D	T	d	t
5		%	5	E	U	e	u				%	5	E	U	e	u
6		&	6	F	V	f	v				&	6	F	V	f	v
7		'	7	G	W	g	w				'	7	G	W	g	w
8		(	8	H	X	h	x				(	8	H	X	h	x
9		)	9	I	Y	i	y				)	9	I	Y	i	y
A		*	:	J	Z	j	z				*	:	J	Z	j	z
B		+	;	K	[	k	{				+	;	K	[	k	{
C		,	<	L	\	l	!				,	<	L	\	l	!
D		-	=	M	]	m	}				-	=	M	]	m	}
E		.	>	N	^	n	~				.	>	N	^	n	~
F		/	?	O		o					/	?	O		o	

### *Epson Near Letter Quality (NLQ) Mode*

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	'	p				0	@	P	'	p	
1		!	1	A	Q	a	q				!	1	A	Q	a	q
2		"	2	B	R	b	r				"	2	B	R	b	r
3		#	3	C	S	c	s				#	3	C	S	c	s
4		\$	4	D	T	d	t				\$	4	D	T	d	t
5		%	5	E	U	e	u				%	5	E	U	e	u
6		&	6	F	V	f	v				&	6	F	V	f	v
7		'	7	G	W	g	w				'	7	G	W	g	w
8		(	8	H	X	h	x				(	8	H	X	h	x
9		)	9	I	Y	i	y				)	9	I	Y	i	y
A		*	:	J	Z	j	z				*	:	J	Z	j	z
B		+	;	K	[	k	{				+	;	K	[	k	{
C		,	<	L	\	l	!				,	<	L	\	l	!
D		-	=	M	]	m	}				-	=	M	]	m	}
E		.	>	N	^	n	~				.	>	N	^	n	~
F		/	?	O		o					/	?	O		o	



# Appendix I

## **ASCII Code Conversion Chart and Proportional Width Tables**

This appendix contains an ASCII code conversion chart and the width of all printable characters and international characters in the proportional mode (available only in the Epson draft pica). The ASCII values for each character remain constant in any mode.

The proportional width table lists all the characters except the international ones. For each character the table lists the decimal (Dec) value, the hexadecimal (Hex) value, a printout of the character (Char), and the width of the character. The width is given in units that are approximately 1/120th of an inch.

In the international character table, each of the international characters is displayed in printout and enlarged matrix form, with the width given at the top right of each matrix. The procedure for using the international characters is given in Chapter 5 .

## ASCII Code Conversion Chart

This chart can be used to convert between the different names for ASCII codes. The codes from 0 to 32 have both decimal and hexadecimal numbers, abbreviations, and the control keys used to type them. The codes above 32 have the character that prints instead of the abbreviation. The Epson character set is the representative set used in this chart. For the equivalent IBM Proprinter character sets, see Appendix K.

Decimal	Hexadecimal	Abbreviation	Control key
0	00	<NUL>	Control-@
1	01	<SOH>	Control-A
2	02	<STX>	Control-B
3	03	<ETX>	Control-C
4	04	<EOT>	Control-D
5	05	<ENQ>	Control-E
6	06	<ACK>	Control-F
7	07	<BEL>	Control-G
8	08	<BS>	Control-H
9	09	<HT>	Control-I
10	0A	<LF>	Control-J
11	0B	<VT>	Control-K
12	0C	<FF>	Control-L
13	0D	<CR>	Control-M
14	0E	<SO>	Control-N
15	0F	<S0>	Control-O
16	10	<DLE>	Control-P
17	11	<DC1>	Control-Q
18	12	<DC2>	Control-R
19	13	<DC3>	Control-S
20	14	<DC4>	Control-T
21	15	<NAK>	Control-U
22	16	<SYN>	Control-V
23	17	<ETB>	Control-W
24	18	<CAN>	Control-X



Decimal	Hexadecimal	Abbreviation	Control key
25	19	<EM>	Control-Y
26	1A	<SUB>	Control-Z
27	1B	<ESC>	Control-[
28	1C	<FS>	
29	1D	<GS>	
30	1E	<RS>	
31	1F	<US>	
32	20	<SP>	

Decimal	Hexadecimal	Character	Decimal	Hexadecimal	Character
33	21	!	68	44	D
34	22	"	69	45	E
35	23	#	70	46	F
36	24	\$	71	47	G
37	25	%	72	48	H
38	26	&	73	49	I
39	27	'	74	4A	J
40	28	(	75	4B	K
41	29	)	76	4C	L
42	2A	*	77	4D	M
43	2B	+	78	4E	N
44	2C	,	79	4F	O
45	2D	-	80	50	P
46	2E	.	81	51	Q
47	2F	/	82	52	R
48	30	0	83	53	S
49	31	1	84	54	T
50	32	2	85	55	U
51	33	3	86	56	V
52	34	4	87	57	W
53	35	5	88	58	X
54	36	6	89	59	Y
55	37	7	90	5A	Z
56	38	8	91	5B	[
57	39	9	92	5C	\
58	3A	:	93	5D	]
59	3B	;	94	5E	^
60	3C	<	95	5F	_
61	3D	=	96	60	`
62	3E	>	97	61	a
63	3F	?	98	62	b
64	40	@	99	63	c
65	41	A	100	64	d
66	42	B	101	65	e
67	43	C	102	66	f

Decimal	Hexadecimal	Character	Decimal	Hexadecimal	Character
103	67	<b>g</b>	115	73	<b>s</b>
104	68	<b>h</b>	116	74	<b>t</b>
105	69	<b>i</b>	117	75	<b>u</b>
106	6A	<b>j</b>	118	76	<b>v</b>
107	6B	<b>k</b>	119	77	<b>w</b>
108	6C	<b>l</b>	120	78	<b>x</b>
109	6D	<b>m</b>	121	79	<b>y</b>
110	6E	<b>n</b>	122	7A	<b>z</b>
111	6F	<b>o</b>	123	7B	<b> </b>
112	70	<b>p</b>	124	7C	<b>!</b>
113	71	<b>q</b>	125	7D	<b>}</b>
114	72	<b>r</b>	126	7E	<b>~</b>

Decimal	Hexadecimal	Abbreviation	Decimal	Hexadecimal	Abbreviation
127	7F	<DEL>	144	<b>90</b>	< <b>DLE</b> >
128	80	<NUL>	145	91	<DC1>
129	81	<SOH>	146	92	<DC2>
130	82	<STX>	147	93	<DC3>
131	83	<ETX>	148	94	<DC4>
132	84	<EOT>	149	95	<NAK>
133	85	< <b>ENQ</b> >	150	96	<SYN>
134	86	<ACK>	151	97	<ETB>
135	87	<BEL>	152	98	<CAN>
136	88	<BS>	153	99	<EM>
137	89	<HT>	154	9A	<SUB>
138	8A	<LF>	155	9B	<ESC>
139	8B	<VT>	156	9C	< <b>FS</b> >
140	8C	<FF>	157	9D	<GS>
141	8D	<CR>	158	9E	<RS>
142	8E	<SO>	159	9F	<US>
143	8F	<SI>	160	<b>A0</b>	<SP>

Decimal	Hexadecimal	Character	Decimal	Hexadecimal	Character
161	A1	<b>!</b>	167	A7	<b>'</b>
162	A2	<b>"</b>	168	A8	<b>(</b>
163	A3	<b>£</b>	169	A9	<b>)</b>
164	A4	<b>\$</b>	170	<b>A4</b>	<b>*</b>
165	A5	<b>%</b>	171	<b>AB</b>	<b>+</b>
166	A6	<b>&amp;</b>	172	<b>AC</b>	<b>,</b>

Decimal	Hexadecimal	Character	Decimal	Hexadecimal	Character
173	AD	-	214	D6	V
174	AE	.	215	D7	W
175	AF	/	216	D8	X
176	B0	0	217	D9	Y
177	B1	1	218	DA	Z
178	B2	2	219	DB	[
179	B3	3	220	DC	\
180	B4	4	221	DD	]
181	B5	5	222	DE	^
182	B6	6	223	DF	_
183	B7	7	224	E0	`
184	B8	8	225	E1	<i>a</i>
185	B9	9	226	E2	<i>b</i>
186	BA	:	227	E3	<i>c</i>
187	BB	;	228	E4	<i>d</i>
188	BC	<	229	E5	<i>e</i>
189	BD	=	230	E6	<i>f</i>
190	BE	>	231	E7	<i>g</i>
191	BF	?	232	E8	<i>h</i>
192	C0	@	233	E9	<i>i</i>
193	C1	<b>A</b>	234	EA	<i>j</i>
194	C2	<b>B</b>	235	EB	<i>k</i>
195	C3	<b>C</b>	236	EC	<i>l</i>
196	C4	<b>D</b>	237	ED	<i>m</i>
197	C5	<b>E</b>	238	EE	<i>n</i>
198	C6	<b>F</b>	239	EF	<i>o</i>
199	C7	<b>G</b>	240	F0	<i>p</i>
200	C8	<b>H</b>	241	F1	<i>q</i>
201	C9		242	F2	<i>r</i>
202	CA	<b>J</b>	243	F3	<i>s</i>
203	CB	<b>K</b>	244	F4	<i>t</i>
204	CC	l	245	F5	<i>u</i>
205	CD	M	246	F6	<i>v</i>
206	CE	N	247	F7	<i>w</i>
207	CF	O	248	F8	<i>x</i>
208	D0	P	249	F9	<i>y</i>
209	D1	<b>Q</b>	250	FA	<i>z</i>
210	D2	R	251	FB	{
211	D3	S	252	FC	
212	D4	T	253	FD	}
213	D5	U	254	FE	~
			255	<b>FF</b>	

# Proportional Width Table

Dec	Hex	Char	Width	Dec	Hex	Char	Width	Dec	Hex	Char	Width
32	20	blank	12	96	60	`	5	192	C0	@	12
33	21	!	5	97	61	a	12	193	C1	A	12
34	22	"	8	98	62	b	12	194	C2	B	12
35	23	#	12	99	63	c	11	195	C3	C	12
36	24	\$	12	100	64	d	11	196	C4	D	12
37	25	%	12	101	65	e	12	197	C5	E	12
36	26	&	12	102	66	f	10	198	C6	F	12
39	27	'	5	103	67	g	11	199	C7	G	12
40	28	(	6	104	68	h	11	200	C8	H	12
41	29	)	6	105	69	i	8	201	C9	I	10
42	2A	*	12	106	6A	j	9	202	CA	J	12
43	2B	+	12	107	6B	k	10	203	CB	K	12
44	2C	,	7	108	6C	l	8	204	CC	L	10
45	2D	-	12	109	6D	m	12	205	CD	H	12
46	2E	.	6	110	6E	n	11	206	CE	N	12
47	2F	/	10	111	6F	o	12	207	CF	O	12
48	30	0	12	112	70	P	11	208	D0	P	12
49	31	1	B	113	71	q	11	209	D1	Q	12
50	32	2	12	114	72	r	11	210	D2	R	12
51	33	3	12	115	73	s	12	211	D3	S	12
52	34	4	12	116	74	t	11	212	D4	T	12
53	35	5	12	117	75	u	12	213	D5	U	12
54	36	6	12	118	76	v	12	214	D6	V	11
55	37	7	12	119	77	w	12	215	D7	W	12
56	38	8	12	120	78	x	10	216	D8	X	12
57	39	9	12	121	79	Y	12	217	D9	Y	12
58	3A	:	6	122	7A	z	10	218	DA	Z	12
59	3B	;	6	123	7B	{	9	219	DB	[	11
60	3C	<	10	124	7C	}	5	220	DC	\	7
61	3D	=	12	125	7D	~	9	221	DD	]	11
62	3E	>	10	126	7E		12	222	DE	^	10
63	3F	?	12	127	7F			223	DF	_	12
64	40	@	12	160	A0	blank	12	224	E0	'	5
65	41	A	12	161	A1	/	10	225	E1	a	11
66	42	B	12	162	A2	"	10	226	E2	b	11
67	43	C	12	163	A3	#	12	227	E3	c	11
68	44	D	12	164	A4	\$	11	228	E4	d	12
69	45	E	12	165	A5	%	12	229	E5	e	11
70	46	F	12	166	A6	&	12	230	E6	f	12
71	47	G	12	167	A7	,	5	231	E7	g	11
72	48	H	12	168	A8	(	8	232	E8	h	11
73	49	I	8	169	A9	)	8	233	E9	i	9
74	4A	J	11	170	AA	*	12	234	EA	j	10
75	4B	K	12	171	AB	+	12	235	EB	k	11
76	4C	L	12	172	AC	,	8	236	EC	l	9
77	4D	M	12	173	AD	-	12	237	ED	m	11
78	4E	N	12	174	AE	.	7	238	EE	n	10
79	4F	O	12	175	AF	/	10	239	EF	o	11
80	50	P	12	176	B0	0	12	240	FO	P	11
81	51	Q	12	177	B1	1	9	241	F1	q	11
82	52	R	12	178	B2	2	12	242	F2	r	10
83	53	S	12	179	B3	3	12	243	F3	s	11
84	54	T	12	180	B4	4	12	244	F4	t	10
85	55	U	12	181	B5	5	12	245	F5	u	11
86	56	V	12	182	B6	6	11	246	F6	v	10
87	57	W	12	183	B7	7	12	247	F7	w	12
88	58	X	10	184	B8	8	12	248	F8	x	12
89	59	Y	12	185	B9	9	11	249	F9	y	11
90	5A	Z	10	186	BA	:	8	250	FA	z	12
91	5B	[	8	187	BB	;	9	251	FE	{	10
92	5C	\	10	188	BC	<	10	252	FC	:	9
93	5D	]	8	189	ED	=	11	253	FD	}	10
94	5E	^	12	190	BE	>	9	254	FE	~	12
95	5F	_	12	191	BF	?	11	255	FF		

International Character Width Table

Roman characters

à 12	è 12	ù 11	ò 10	ì 6	° 8	£ 12	í 5
ç 12	ñ 12	ñ 11	ø 12	ķ 12	À 12	à 12	ç 11
š 10	ß 11	£ 12	æ 12	ø 12	ø 12	° 8	À 12
ö 12	ü 12	ä 12	ö 10	ü 11	é 12	é 12	¥ 12

Italic characters

à 11	è 11	ù 11	ò 11	ì 8	° 8	£ 12	/ 10
ç 11	ñ 12	ñ 12	ø 12	ķ 12	À 12	à 11	ç 11
š 12	ß 11	£ 12	æ 12	ø 12	ø 11	° 9	À 12
ö 12	ü 12	ä 11	ö 11	ü 12	é 12	é 11	¥ 12



# Appendix J

## IBM Proprinter Mode

### Command Summary

This appendix describes the IBM Proprinter commands first in numerical order, and then in detail. The individual command descriptions are divided in the following way:

- Character Width
- Print Enhancement
- Page Formatting
- Graphics
- Other Codes

You should consult this section if you're using the IBM Proprinter mode, or the Epson section if you're using the Epson mode. If a command functions in the same way in both modes, it is described in both sections. If a command is available in only one mode or if it has a different function in the other mode, the comments indicate either Epson only or IBM only.

Each command has a format section and a comment section. The format section gives the ASCII, decimal, and hexadecimal codes for the command. In some cases there is also a control key code because some commercial software programs can use a control key for a code between 0 and 27 (decimal). In this section, CTRL O, for example, means hold down the control key while you press o.

Letters in parentheses, such as (n) or (d), are variables, which are explained in the comments sections.

In BASIC you can use either decimal or hexadecimal numbers, and if there is a single letter in the second ASCII code column, you can use that letter in quotation marks instead of the number below it. For

example, the format section for the n/72-inch line spacing command is as follows:

<b>ASCII code:</b>	<b>ESC</b>	<b>A</b>	<b>(n)</b>
Decimal:	27	65	( n )
Hexadecimal:	<b>1 B</b>	41	(n)

In BASIC you can send the command to set the n/72-inch line spacing to 8 in three ways:

```
Decimal :          LPRINT CHR$(27) CHR$(65) CHR$(8)
Hex:           LPRINT CHR$(&H1B) CHR$(&H41) CHR$(&H38)
Decimal with quotes: LPRINT CHR$(27) "A" CHR$(8)
```

ESCAPE sequences that require a 0 or 1 with a letter, such as ESC "W1 " to turn on double-width, can use either the ASCII code or the numeral in quotation marks for the 0 or 1. For example, in BASIC you can turn on double-width with either of the formats below:

```
LPRINT CHR$(27) "W1 " or LPRINT CHR$(27) "W"CHR$(1)
```

## Selecting the IBM Proprinter Mode

To set the **FX-286** in the IBM Proprinter mode, you need to reset three DIP switches (see Appendix A). Once the **FX-286** is set in the IBM mode, the printer responds to commands like a Proprinter, and prints in the selected character set.

Reset the following DIP switches to select the Proprinter mode:

<b>DIP Switch</b>	<b>Factory Setting</b>	<b>Proprinter Setting</b>
1-4	ON	OFF
2-1	ON	OFF
2-3	OFF	ON

## Printing the Alternate and All Print character sets

The IBM Proprinter has three character sets: Standard, Alternate, and All Print (see Appendix K for printouts of all three sets). Two of the sets, Standard and Alternate, can be selected with DIP switches. The third set, All Print, can only be selected with ESCAPE code "\ " or "^". See this appendix for complete descriptions of these codes.



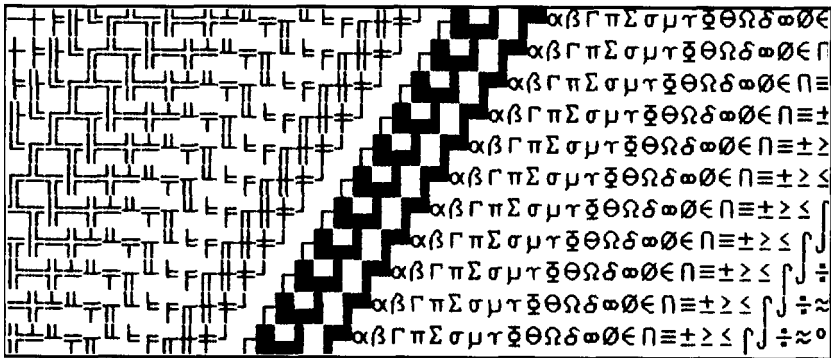
The DIP switch settings for the Standard and Alternate sets are:

DIP Switch	Standard	Alternate
1-6	ON	Set any one of
1-7	ON	these three
1-8	ON	switches to OFF.

**Running the self test in the IBM Proprinter mode**

If you want to run a self test to see what the IBM Proprinter character sets look like, you only have to reset DIP switch 1-4 from ON to OFF.

To run the self test, make sure the power is OFF, then hold down the DRAFT button while turning the power switch ON-the self test takes over and the FX-286 starts printing out the Standard IBM Proprinter character set, as shown in Figure J-1.



**Figure J-1. IBM Proprinter mode self test**

If you want to see the Alternate set, turn the power OFF. Then reset **either** switch 1-6, 1-7, or 1-8 from ON to OFF, and run the self test again.

Remember, you must also reset DIP switches 2-1 and 2-3 as previously mentioned if you want to select the IBM Proprinter mode for uses other than the self test.

# Software Commands in Numerical Order

The following list shows the control codes and ESC sequences that the FX-286 uses along with their decimal values. For further details on their use, consult the index to find out where they are discussed in detail. The number after each name is the page where the command is described.

	7	BEL	Beeper .....	J-24
	8	BS	Backspace .....	J-25
	9	HT	Tab Horizontally .....	J-20
	10	LF	Line Feed .....	J-16
	11	VT	Tab Vertically .....	J-20
	12	FF	Form Feed .....	J-18
	13	CR	Carriage Return .....	J-25
	14	s o	Select Double-width Mode (one line) ..	J-10
	15	SI	Select Condensed Mode .....	J-9
	17	DC1	Select Printer .....	J-26
	18	DC2	Select Pica Mode .....	J-9
	20	DC4	Cancel Double-width Mode (one line) .	J-11
	24	CAN	Cancel Line .....	J-25
ESC	14	ESC SO	Select Double-width Mode (one line) ..	J-10
ESC	15	ESC SI	Select Condensed Mode .....	J-9
ESC	45	ESC -	Select/Cancel Underline .....	J-14
ESC	48	ESC 0	Select 1/8-inch Line Spacing .....	J-16
ESC	49	ESC 1	Select 7/72-inch Line Spacing .....	J-17
ESC	50	ESC 2	Execute Line Spacing .....	J-17
ESC	51	ESC 3	Select n/216-inch Line Spacing .....	J-17
ESC	52	ESC 4	Resets Top of Form .....	J-19
ESC	53	ESC 5	Automatic Line Feed .....	J-26
ESC	54	ESC 6	Select Alternate Character Set .....	J-12
ESC	55	ESC 7	Select Standard Character Set .....	J-12
ESC	56	ESC 8	Disable Paper-out Sensor .....	J-26
ESC	57	ESC 9	Enable Paper-out Sensor .....	J-27
ESC	58	ESC:	Select Elite Mode .....	J-10
ESC	61	ESC =	Define User-defined Characters .....	J-23
ESC	65	ESC A	Set n/72-inch Line Spacing .....	J-18
ESC	66	ESC B	Select Vertical Tabs .....	J-21
ESC	67	ESC C	Select Page Length in Lines .....	J-19
ESC	67	ESC C 0	Select Page Length in Inches .....	J-19
ESC	68	ESC D	Set Horizontal Tabs .....	J-20

ESC	69	ESC E	Select Emphasized Mode . . . . .	J-11
ESC	70	ESC F	Cancel Emphasized Print . . . . .	J-12
ESC	71	ESC G	Select NLQ (Double-strike) Mode . . . .	J-13
ESC	72	ESC H	Cancel NLQ (Double-strike) Mode . . . .	J-13
ESC	73	ESC I	Select Print Mode . . . . .	J-13
ESC	74	ESC J	Immediate n/216-inch Line Feed . . . . .	J-18
ESC	75	ESC K	Single-density Graphics . . . . .	J-21
ESC	76	ESC L	Low-speed Double-density Graphics . . .	J-22
ESC	78	ESC N	Select Skip-over-perforation . . . . .	J-15
ESC	79	ESC O	Cancel Skip-over-perforation . . . . .	J-16
ESC	81	ESC Q3	Deselects Printer . . . . .	J-27
ESC	82	ESC R	Return to Default Tabs . . . . .	J-21
ESC	83	ESC S 0	Select Superscript . . . . .	J-14
ESC	83	ESC S 1	Select Subscript . . . . .	J-14
ESC	84	ESC T	Cancel Superscript/Subscript . . . . .	J-14
ESC	85	ESC U	Select Unidirectional Mode . . . . .	J-27
ESC	87	ESC W	Select/Cancel Double-width Mode . . . .	J-11
ESC	88	ESC X	Set Margins . . . . .	J-15
ESC	89	ESC Y	High-speed Double-density Graphics . . .	J-22
ESC	90	ESC Z	Quadruple-density Graphics . . . . .	J-22
ESC	92	ESC \	Print from All Print Table . . . . .	J-24
ESC	94	ESC ^	Print One Character from All Print Table	J-24
ESC	95	ESC —	Select/Cancel Overscore . . . . .	J-15



# **IBM Proprinter Mode Commands**



## Character Width

### SI

### Select Condensed Mode

#### Format:

ASCII code: SI  
Decimal: 15  
Hexadecimal: 0F  
Control: CTRL O

#### Comments:

Condensed mode has 17.16 characters per inch.

### ESC SI

### Select Condensed Mode

#### Format:

ASCII code:	ESC	SI
Decimal:	27	15
Hexadecimal:	1B	0F

#### Comments:

Duplicates the SI command.

### DC2

### Select Pica Mode

#### Format:

ASCII code: DC2  
Decimal: 18  
Hexadecimal: 12  
Control: CTRL R

#### Comments:

Selects 10 cpi (Pica) mode. Cancels condensed and elite printing set by SI, ESC SI, or ESC .:

- IBM only

**ESC :****Select Elite Mode**

---

**Format:**

ASCII code:   ESC           :  
Decimal:       27           58  
Hexadecimal: 3 A

**Comments:**

Selects 12 cpi (Elite Mode).

- IBM only

**SO****Select Double-width Mode (one line)**

---

**Format:**

ASCII code:   SO  
Decimal:       14  
Hexadecimal: 0 E  
Control:       CTRL N

**Comments:**

Doubles the width of all characters. It is cancelled by a carriage return, ESC WO, or DC4.

**ESC SO****Select Double-width Mode (one line)**

---

**Format:**

ASCII code:   ESC       SO  
Decimal :       27       14  
Hexadecimal: 1B       0E

**Comments:**

Duplicates the SO command.



## DC4

## Cancel Double-width Mode (one line)

### Format:

ASCII code: DC4  
Decimal: 20  
Hexadecimal: 14  
Control: CTRL T

### Comments:

Cancels one-line double-width printing selected by SO or ESC SO, but not double-width printing set by **ESC W** or ESC!.

## ESC W

## Select/Cancel Double-width Mode

### Format:

ASCII code:	ESC	W	(n)
Decimal:	27	87	(n)
Hexadecimal:	1B	57	(n)

### Comments:

Double-width mode doubles **the** width of all characters.

n = 1 selects the mode

n = 0 cancels it

## Print Enhancement

## ESC E

## Select Emphasized Mode

### Format:

ASCII code:	ESC	E
Decimal:	27	69
Hexadecimal:	1B	45

### Comments:

In emphasized each dot is printed twice, with the second dot slightly to the right of the first. Reduces print head speed.

## ESC F

## Cancel Emphasized Mode

### Format:

ASCII code:	ESC	F
Decimal :	27	70
Hexadecimal:	1B	<b>46</b>

### Comments:

Turns off the mode selected by ESC E.

## ESC 6

## Select Alternate Character Set

### Format:

ASCII code:	ESC	6
Decimal:	27	54
Hexadecimal:	1B	<b>36</b>

### Comments:

Selects alternate IBM character set. See Appendix K for character set tables.

- IBM only.

## ESC 7

## Select Standard Character Set

### Format:

ASCII code:	ESC	7	(n)
Decimal:	27	55	(n)
Hexadecimal:	1B	<b>37</b>	<b>(n)</b>

### Comments:

Selects standard character set if the alternate character set has been previously selected. See Appendix K for character set tables.

- IBM only.

## ESC G

## Select NLQ (Double-strike) Mode

### Format:

ASCII code:	ESC	G
Decimal:	27	71
Hexadecimal:	1B	47

### Comments:

Selects double-strike mode, selects NLQ mode in pica or elite.

## ESC H

## Cancel NLQ (Double-strike) Mode

### Format:

ASCII code:	ESC	H
Decimal:	27	72
Hexadecimal:	1B	48

### Comments:

Turns off the mode selected by ESC G.

## ESC I

## Select Print Mode

### Format:

ASCII code:	ESC	I	(n)
Decimal:	27	73	(n)
Hexadecimal:	1B	49	(n)

### Comments:

When  $n = 0$ , the standard draft font is selected; when  $n = 2$ , the standard Near Letter Quality font is selected. **When**  $n = 4$ , a user-defined font is selected; when  $n = 6$ , a user-defined NLQ font is selected.

- IBM only

**ESC S0****Select Superscript****Format:**

ASCII code:	ESC	S	0
Decimal:	27	83	0
Hexadecimal:	1B	53	0

**Comments:**

Selects superscript.

**ESC S1****Select Subscript****Format:**

ASCII code:	ESC	S	1
Decimal:	27	83	1
Hexadecimal:	1B	53	1

**Comments:**

Selects subscript.

**ESC T****Cancel Superscript/Subscript****Format:**

ASCII code:	ESC	T
Decimal:	27	84
Hexadecimal:	1B	54

**Comments:**

Cancels either mode.

**ESC -****Select/Cancel Underline****Format:**

ASCII code:	ESC	-	(n)
Decimal:	27	45	(n)
Hexadecimal:	1B	2D	(n)

**Comments:**

When  $n = 1$ , underline is turned on, when  $n = 0$ , underline is cancelled.

## ESC —

## Select/Cancel Overscore

### Format:

ASCII code:	ESC	—	(n)
Decimal :	27	95	(n)
Hexadecimal:	1 B	5F	(n)

### Comments:

When n = 1, overscore is turned on, when n = 0, overscore is cancelled.

- IBM only

## Page Formatting

### Margins

## ESC X

## Set Margins

### Format:

ASCII code:	ESC	X	(n1)	(n2)
Decimal:	27	88	(n1)	(n2)
Hexadecimal:	1 B	58	(n1)	(n2)

### Comments:

The left margin column is set to n1 in the current width, and the right margin column is set to n2.

- IBM only.

## ESC N

## Select Skip-over-perforation

### Format:

ASCII code:	ESC	N	(n)
Decimal:	27	78	(n)
Hexadecimal:	1 B	4E	(n)

### Comments:

The variable n = number of lines skipped between the last line printed on one page and the first line on the next page. For example, with the standard settings for line spacing and page length (66 lines) ESC N 6 will cause the FX-286 to print 60 lines and then skip six. DIP switch 2-3 and SelecType mode 10 perform the same function.

**ESC 0**

**Cancel Skip-over-perforation**

---

**Format:**  
ASCII code:    ESC        0  
Decimal:        27        79  
Hexadecimal: 1 B        4F

**Comments:**  
Cancels the mode selected by ESC N.

**Line spacing**

**LF**

**Line Feed**

---

**Format:**  
**ASCII code:** L F  
Decimal:        10  
Hexadecimal: 0 A  
Control:        CTRL J

**Comments:**  
When this command is received, the data in the print buffer is printed and the paper advances one line in the current line spacing.

**ESC 0**

**Select 1/8-inch Line Spacing**

---

**Format:**  
**ASCII code:**    ESC        0  
Decimal :        27        40  
Hexadecimal: 1 B        30

**Comments:**  
Sets the line spacing to 1/8 of an inch for subsequent line feed commands. The “0” is the digit zero and not ASCII code 0 .

## **ESC 1**

## **Select 7/7-inch Line Spacing**

### **Format:**

ASCII code:	<b>ESC</b>	1
Decimal:	27	49
Hexadecimal:	1 B	31

### **Comments:**

Sets the line spacing to 7/72 of an inch for subsequent line feed commands. The "1" is the digit one and not lower case L or ASCII code 1.

## **ESC 2**

## **Execute Line Spacing**

### **Format :**

ASCII code:	<b>ESC</b>	2
Decimal:	27	50
Hexadecimal:	1 B	<b>32</b>

### **Comments:**

Executes the line spacing stored in memory by ESC A. If no ESC A command has been sent, ESC 2 sets the line spacing to 1/6 of an inch. The "2" is the digit two and not ASCII code 2.

- IBM only

## **ESC 3**

## **Select n/216-inch Line Spacing**

### **Format:**

ASCII code:	<b>ESC</b>	3	(n)
Decimal:	27	51	(n)
Hexadecimal:	1 3	<b>33</b>	<b>(n)</b>

### **Comments:**

Sets the line spacing to n/216 of an inch for subsequent line feed commands. The "3" is the digit three and not ASCII code 3. The value of n should be in the range 0 to 255.

ESC A

Set n/72-inch Line Spacing

---

**Format:**

ASCII code:	ESC	A	(n)
Decimal:	27	55	(n)
Hexadecimal:	1 3	41	(n)

**Comments:**

Sets the line spacing to n/72 of an inch. This value is stored in memory until the printer receives the ESC 2 code that makes the ESC A setting take effect. The value of n should be in the range 0 to 85.

- IBM only.

ESC J

Immediate n/216-inch Line Feed

---

**Format:**

ASCII code:	ESC	J	(n)
Decimal:	27	74	(n)
Hexadecimal:	1 B	4A	(n)

**Comments:**

Advances the paper by one line at a spacing of n/216 of an inch. The value of n should be in the range 0 to 255. This produces an immediate line feed and carriage return but does not affect subsequent line spacing.

- IBM only

Form feed and page length

FF

Form Feed

---

**Format:**

ASCII code:	F F
Decimal:	12
Hexadecimal:	0C
Control:	CTRL L

**Comments:**

Prints the data in the print buffer and advances the paper to the top of the next page according to the current page length.



**ESC C****Select Page Length in Lines**

---

**Format:**

ASCII code:	ESC	C	(n)
Decimal:	27	67	(n)
Hexadecimal:	1B	43	(n)

**Comments:**

Sets the page length to n lines. The value of n should be between 1 and 127.

**ESC C0****Select Page Length in Inches**

---

**Format:**

ASCII code:	ESC	C	0	(n)
Decimal:	27	67	0	( n )
Hexadecimal:	1B	43	00	(n)

**Comments:**

Sets the page length to n inches where n has a value of 1 to 22.

**ESC 4****Resets Top of Form**

---

**Format :**

ASCII code:	ESC	4
Decimal:	27	52
Hexadecimal:	1B	34

**Comments:**

Resets top of form to current position.

- IBM only

**Tabs**

<b>H T</b>	<b>Tab Horizontally</b>
------------	-------------------------

**Format:**

ASCII code: H T  
Decimal: 9  
Hexadecimal: 09  
Control: CTRL I

**Comments:**

Advances the print position to the next horizontal tab setting.

<b>ESC D</b>	<b>Set Horizontal Tabs</b>
--------------	----------------------------

**Format:**

ASCII code:	ESC	D	(n1)	(n2)	...	0
Decimal:	27	68	(n1)	(n2)	...	0
Hexadecimal:	1 B	44	(n1)	(n2)	...	00

**Comments:**

This command allows setting of up to 28 horizontal tabs. These are entered as n1, n2, n3, etc. (in the range 1 to 255) with ASCII 0 character as the terminator. The tab settings n1, n2, n3, etc. must be entered in ascending order. If n1 = 0, all tabs are cleared. The settings on power up are every eight characters.

<b>VT</b>	<b>Tab Vertically</b>
-----------	-----------------------

**Format:**

ASCII code: VT  
Decimal: 11  
Hexadecimal: 0 B  
Control: CTRL K

**Comments:**

Advances the paper to the next tab setting. If no vertical tabs have been selected, the paper advances one line.

ESC B

Select Vertical Tabs

Format:

ASCII code:	ESC	B	(n1)	(n2)	...	0
Decimal:	27	66	(n1)	(n2)	...	0
Hexadecimal:	1B	42	(n1)	(n2)	...	0 0

Comments:

Sets up to 64 vertical tabs in the current line spacing. Tab settings are not affected by subsequent changes in line spacing. Terminate this tab sequence with 0 or a number less than that of the last tab. Be sure that page length is set by ESC “C” command before using this.

ESC R

Return to Default Tabs

Format :

ASCII code:	ESC	R
Decimal:	27	82
Hexadecimal:	1B	52

Comments:

Returns the horizontal and vertical tabs to their default settings.

- IBM only.

Graphics

ESC K

Select Single-density Graphics Mode

Format:

ASCII code:	ESC	K	(n1)	(n2)
Decimal:	27	75	(n1)	(n2)
Hexadecimal:	1B	4B	(n1)	(n2)

Comments:

Turns on single-density graphics mode with 480 possible dots per eight-inch line and 816 per 13.6-inch line.

If d is the total number of columns required,

n1 = d MOD 256

n2 = INT(d / 256)

This command must be followed by d data numbers.

## **ESC L            Select Low-speed Double-density Graphics Mode**

---

### **Format:**

ASCII code:	ESC	L	(n1)	(n2)
Decimal :	27	76	(n1)	(n2)
Hexadecimal:	1 B	4C	(n1)	(n2)

### **Comments:**

Turns on low-speed double-density graphics mode with 960 possible dots per eight-inch line and 1632 per 13.6-inch line.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n-12 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

## **ESC Y            Select High-speed Double-density Graphics Mode**

---

### **Format:**

ASCII code:	ESC	Y	(n1)	(n2)
Decimal:	27	69	(n1)	(n2)
Hexadecimal:	1 B	59	(n1)	(n2)

### **Comments:**

Turns on high-speed double-density graphics mode with 960 possible dot positions per eight-inch line and 1632 per 13.6-inch line. Will not print consecutive dots in a row.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

## **ESC Z            Select Quadruple-density Graphics Mode**

---

### **Format:**

ASCII code:	ESC	Z	(n1)	(n2)
Decimal :	27	90	(n1)	(n2)
Hexadecimal:	1 B	5A	(n1)	(n2)

### **Comments:**

Turns on quadruple-density graphics mode with 1920 possible dot positions per eight-inch line and 3264 per 13.6-inch line. Will not print consecutive dots in a row.

If d is the total number of columns required,

$n1 = d \text{ MOD } 256$

$n2 = \text{INT}(d / 256)$

This command must be followed by d data numbers.

# ESC =

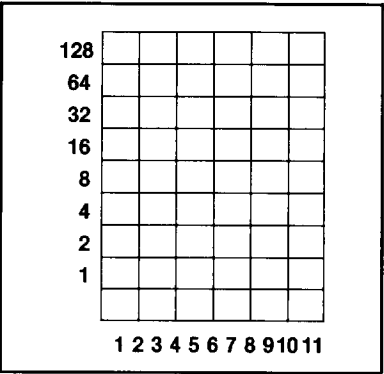
# Define User-defined Characters

## Format:

ASCII code:	<b>ESC</b>	=	(n1)	(n2)	...	(nk)
Decimal :	27	61	(n1)	(n2)	...	(nk)
Hexadecimal :	1B	3D	(n1)	(n2)	...	(nk)

## Comments:

If C is the total number of characters to be defined,  
 $B = (C \times 13) + 2$   
 $n1 = B \text{ MOD } 256$   
 $1-2 = \text{INT}(B / 256)$   
 $n3 = 20$  in all cases  
 $n4$  = the code of the first character to be defined  
 $n5 = 0$  if the top eight pins are to be used;  $n5 = 128$  for the bottom eight  
 $n6 = 0$  in all cases  
 $n7$  through  $nk$  are the data numbers that define the characters, with 11 data numbers for each character.  
The data numbers for each character are determined as shown on the grid below:



**Determining data numbers**

To print a user-defined character, you must use ESCape I, which is described in this appendix.

- IBM only

ESC \

Print from All Print Table

Format:

ASCII code:	ESC	\	(n <sub>1</sub> )	(n <sub>2</sub> )
Decimal:	27	92	(n <sub>1</sub> )	(n <sub>2</sub> )
Hexadecimal:	1B	5C	(n <sub>1</sub> )	(n <sub>2</sub> )

Comments:

Causes the FX-286 to print from the All Print table in Appendix K for the number of characters determined by n1 and n2. No control codes function when this mode is in effect. The total number of characters affected by this command is  $n1 + (n2 \times 256)$ .

- IBM only

ESC ^

Print One Character from All Print Table

Format:

ASCII code:	ESC	^
Decimal:	27	94
Hexadecimal:	1B	5E

Comments:

Allows the printing of one character from the All Print table in Appendix K.

- IBM only

Other Codes

BEL

Beeper

Format:

ASCII code:	BEL
Decimal:	7
Hexadecimal:	07
Control:	CTRL G

Comments:

Sounds the printer's beeper.

**BS****Backspace**

---

**Format:**

ASCII code: B S  
Decimal: 8  
Hexadecimal: 08  
Control: CTRL H

**Comments:**

Prints out data in the print buffer, then moves the prints position one space to the left. If this code is received immediately after graphics printing, the print position of subsequent data is moved back to the point at which graphics printing started.

**CR****Carriage Return**

---

**Format:**

ASCII code: CR  
Decimal: 13  
Hexadecimal : 0D  
Control: CTRL M

**Comments:**

Prints the data in the buffer and returns the print position to the left margin.

**CAN****Cancel Line**

---

**Format:**

ASCII code: **CAN**  
Decimal : 24  
Hexadecimal: 18  
Control: CTRL X

**Comments:**

Removes all text in the print buffer, but does not affect control codes.

**Format:**

ASCII code:     **DC1**  
 Decimal:         **17**  
 Hexadecimal:   **11**  
 Control:         **CTRL Q**

**Comments:**

Returns the printer to the on-line mode if it has been switched off by the printer deselect code, ESC Q3. It will not switch the printer on-line if it has been switched off using the ON LINE button on the control panel.

**ESC 5****Automatic Line Feed****Format:**

ASCII code:	<b>ESC</b>	<b>5</b>	<b>(n)</b>
Decimal:	<b>27</b>	<b>53</b>	<b>(n)</b>
Hexadecimal:	<b>1 B</b>	<b>35</b>	<b>(n)</b>

**Comments:**

If n = 1, the printer adds a line feed to each carriage return.

If n = 0, it does not.

- IBM only.

**ESC 8****Disable Paper-out Sensor****Format:**

ASCII code:	<b>ESC</b>	<b>8</b>
Decimal:	<b>27</b>	<b>56</b>
Hexadecimal:	<b>1 B</b>	<b>38</b>

**Comments:**

Turns off the paper-out sensor so that you can print to the end of a single sheet of paper. This command duplicates the function of DIP switch 1-2. Computer systems that monitor printer cable pin 12 will ignore both ESCape 8 and the setting of switch 1-2. If you have such a system and want to print on the bottom two inches of a sheet of paper, there are two solutions to this problem. Buy a computer cable designed to overcome the problem; or use longer paper as a backing sheet.



ESC 9

Enable Paper-out Sensor

Format:

ASCII code:	ESC	9
Decimal :	27	57
Hexadecimal:	1 B	39

Comments:

Turns on paper-out sensor so that the printer beeper sounds when the printer runs out of paper.

ESC Q 3

Deselect Printer

Format:

ASCII code:	ESC	Q	3
Decimal :	27	81	51
Hexadecimal:	1 B	51	33

Comments:

Deselects printer under software control. This command is cancelled by DC1.

- IBM only

ESC U

Select Unidirectional Mode

Format:

ASCII code:	ESC	U	(n)
Decimal:	27	85	(n)
Hexadecimal:	1 B	55	(n)

Comments:

Selects unidirectional printing for more accurate positioning during text printing.

n = 1 selects the feature

n = 0 cancels it.

(Graphics printing is always unidirectional.)



# Appendix K

## **FX-286 Character Fonts-IBM Proprinter Mode**

This appendix shows the character fonts available on the FX-286 printer in the IBM Proprinter mode. In order to present the character sets as clearly as possible, the tables in this appendix are arranged by hexadecimal numbers. There is also a hexadecimal to decimal conversion table for those who prefer to use decimal numbers.

# How to Use the Charts

To determine the hexadecimal number that prints a particular character, find the character in one of the tables; then look at the top of its column and at the beginning of its row. The number at the top of the column is the first digit of the character's hex code, and the number at the beginning of the row is the second digit of the hex code.

For example, find the capital Z in the IBM Standard chart on the next page. At the top of its column is 5 and at the beginning of its row is A. Therefore the hex code for a capital Z is 5A.

## Converting hexadecimal numbers to decimal numbers

If you prefer to use decimal numbers instead of hexadecimal numbers, you can convert them with the chart below. Just read down in the column for the first digit of the hex number and across in the row for the second digit. Where the two intersect is the decimal number that corresponds to your hex number. For example, to find the decimal equivalent of hex 5A, look where column 5 intersects with row A. There you will find decimal 90.

*Hex-to-Decimal Conversion Chart*

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
1	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
2	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
3	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
4	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
5	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
6	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
7	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
8	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
9	9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
A	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
B	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
C	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
D	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
E	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
F	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

# **IBM Standard Character Set**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	NUL		Á	⋮	L	ll	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	⋮	⌈	⌊	β	±
2		DC2	"	2	B	R	b	r		DC2	ó	⋮	⌈	⌊	Γ	≥
3			#	3	C	S	c	s			ú	⋮	⌈	⌊	Π	≤
4		DC4	\$	4	D	T	d	t		DC4	ñ	⋮	⌈	⌊	Σ	∫
5			%	5	E	U	e	u			ñ	⋮	⌈	⌊	σ	∫
6			&	6	F	V	f	v			æ	⋮	⌈	⌊	μ	÷
7	BEL		'	7	G	W	g	w	BEL		ð	⋮	⌈	⌊	τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	⋮	⌈	⌊	ø	°
9	HT		)	9	I	Y	i	y	HT		⌈	⋮	⌈	⌊	Θ	·
A	LF		*	:	J	Z	j	z	LF		⌈	⋮	⌈	⌊	Ω	-
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½	⋮	⌈	⌊	δ	√
C	FF		,	<	L	\	l	:	FF		¼	⋮	⌈	⌊	ø	π
D	CR		-	=	M	]	m	}	CR		í	⋮	⌈	⌊	Ø	²
E	SO		.	>	N	^	n	~	SO		«	⋮	⌈	⌊	€	■
F	SI		/	?	O	_	o		SI		»	⋮	⌈	⌊	Π	SP

## **IBM NLQ Standard Character Set**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	NUL		Á	⋮	L	ll	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	⋮	⌈	⌊	β	±
2		DC2	"	2	B	R	b	r		DC2	ó	⋮	⌈	⌊	Γ	≥
3			#	3	C	S	c	s			ú	⋮	⌈	⌊	Π	≤
4		DC4	\$	4	D	T	d	t		DC4	ñ	⋮	⌈	⌊	Σ	∫
5			%	5	E	U	e	u			ñ	⋮	⌈	⌊	σ	∫
6			&	6	F	V	f	v			æ	⋮	⌈	⌊	μ	÷
7	BEL		'	7	G	W	g	w	BEL		ð	⋮	⌈	⌊	τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	⋮	⌈	⌊	ø	°
9	HT		)	9	I	Y	i	y	HT		⌈	⋮	⌈	⌊	Θ	·
A	LF		*	:	J	Z	j	z	LF		⌈	⋮	⌈	⌊	Ω	-
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½	⋮	⌈	⌊	δ	√
C	FF		,	<	L	\	l	:	FF		¼	⋮	⌈	⌊	ø	π
D	CR		-	=	M	]	m	}	CR		í	⋮	⌈	⌊	Ø	²
E	SO		.	>	N	^	n	~	SO		«	⋮	⌈	⌊	€	■
F	SI		/	?	O	_	o		SI		»	⋮	⌈	⌊	Π	SP

# IBM Alternate Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	NUL		SP	0	@	P	'	p	Ç	É	á			L	ll	α	≡
1		DC1	!	1	A	Q	a	q	Ü	æ	í			l	T	β	±
2		DC2	"	2	B	R	b	r	é	æ	ó				T	Γ	≥
3	♥		#	3	C	S	c	s	â	ô	ú				T	Π	≤
4	♦	DC4	\$	4	D	T	d	t	ä	ö	ñ				L	Σ	∫
5	♣		%	5	E	U	e	u	à	ò	ñ				F	σ	∫
6	♠		&	6	F	V	f	v	à	ü	ä				F	μ	÷
7	BEL		'	7	G	W	g	w	ç	ù	ö				T	τ	≈
8	BS	CAN	(	8	H	X	h	x	ë	ÿ	¿				T	ø	°
9	HT		)	9	I	Y	i	y	è	ö	Γ				T	Θ	.
A	LF		*	:	J	Z	j	z	è	Ü	Γ					Ω	.
B	VT	ESC	+	;	K	[	k	{	ï	ø	½					δ	√
C	FF		,	<	L	\	l		ï	ø	¼					ø	n
D	CR		-	=	M	]	m	}	ï	ø	¼					ø	z
E	SO		.	>	N	^	n	~	À	Ê	«					€	■
F	SI		/	?	O	_	o		À	Ê	»					Π	SP

## IBM NLQ Alternate Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p	Ç	É	á		L	ll	α	≡
1		DC1	!	1	A	Q	a	q	Ü	æ	í		l	T	β	±
2		DC2	"	2	B	R	b	r	é	æ	ó			T	Γ	≥
3	♥		#	3	C	S	c	s	â	ô	ú			T	Π	≤
4	♦	DC4	\$	4	D	T	d	t	ä	ö	ñ			L	Σ	∫
5	♣		%	5	E	U	e	u	à	ò	ñ			F	σ	∫
6	♠		&	6	F	V	f	v	à	ü	ä			F	μ	÷
7	BEL		'	7	G	W	g	w	ç	ù	ö			T	τ	≈
8	BS	CAN	(	8	H	X	h	x	ë	ÿ	¿			T	ø	°
9	HT		)	9	I	Y	i	y	è	ö	Γ			T	Θ	.
A	LF		*	:	J	Z	j	z	è	Ü	Γ				Ω	.
B	VT	ESC	+	;	K	[	k	{	ï	ø	½				δ	√
C	FF		,	<	L	\	l		ï	ø	¼				ø	n
D	CR		-	=	M	]	m	}	ï	ø	¼				ø	z
E	SO		.	>	N	^	n	~	À	Ê	«				€	■
F	SI		/	?	O	_	o		À	Ê	»				Π	SP

# IBM All Print Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	SP	SP	SP	0	@	P	'	p	Q	é	á		L	ll	α	≡
1	SP	SP	!	1	A	Q	a	q	ü	æ	í		l	ll	β	±
2	SP	SP	"	2	B	R	b	r	é	æ	ó		l	ll	Γ	≥
3	♥	SP	#	3	C	S	c	s	ä	ö	ú		l	ll	π	≤
4	♦	η	\$	4	D	T	d	t	ä	ö	ü		l	ll	Σ	∫
5	♣	§	%	5	E	U	e	u	ä	ö	ü		l	ll	σ	∫
6	♣	SP	&	6	F	V	f	v	ä	ü	ä		l	ll	μ	÷
7	SP	SP	'	7	G	W	g	w	é	ü	ö		l	ll	τ	≈
8	SP	SP	(	8	H	X	h	x	é	ý	ö		l	ll	θ	°
9	SP	SP	)	9	I	Y	i	y	é	ö	ü		l	ll	Θ	·
A	SP	→	*	:	J	Z	j	z	é	ü	ü		l	ll	Ω	-
B	SP	←	+	;	K	[	k	{	i	ü	½		l	ll	δ	√
C	SP	SP	,	<	L	\	l		i	ü	¼		l	ll	δ	n
D	SP	SP	-	=	M	]	m	}	i	ü	¥		l	ll	Ø	2
E	SP	SP	.	>	N	^	n	~	Ä	ä	«		l	ll	€	■
F	SP	Ø	/	?	O	_	o		Ä	ä	»		l	ll	Π	SP

## IBM NLQ All Print Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	SP	SP	SP	0	@	P	'	p	Q	é	á		L	ll	α	≡
1	SP	SP	!	1	A	Q	a	q	ü	æ	í		l	ll	β	±
2	SP	SP	"	2	B	R	b	r	é	æ	ó		l	ll	Γ	≥
3	♥	SP	#	3	C	S	c	s	ä	ö	ú		l	ll	π	≤
4	♦	η	\$	4	D	T	d	t	ä	ö	ü		l	ll	Σ	∫
5	♣	§	%	5	E	U	e	u	ä	ö	ü		l	ll	σ	∫
6	♣	SP	&	6	F	V	f	v	ä	ü	ä		l	ll	μ	÷
7	SP	SP	'	7	G	W	g	w	é	ü	ö		l	ll	τ	≈
8	SP	SP	(	8	H	X	h	x	é	ý	ö		l	ll	θ	°
9	SP	SP	)	9	I	Y	i	y	é	ö	ü		l	ll	Θ	·
A	SP	→	*	:	J	Z	j	z	é	ü	ü		l	ll	Ω	-
B	SP	←	+	;	K	[	k	{	i	ü	½		l	ll	δ	√
C	SP	SP	,	<	L	\	l		i	ü	¼		l	ll	δ	n
D	SP	SP	-	=	M	]	m	}	i	ü	¥		l	ll	Ø	2
E	SP	SP	.	>	N	^	n	~	Ä	ä	«		l	ll	€	■
F	SP	Ø	/	?	O	_	o		Ä	ä	»		l	ll	Π	SP





# INDEX

Note: See Appendixes G and J for listings and descriptions of specific commands or ESCape sequences.

## A

Access cover, 1-3, A-2  
Alternate character set, IBM, 5-5, A-3, J-2 —J-3, K-1  
    listing, 5-2, K-4  
American Standard Code for Information Interchange.  
    *See* ASCII  
Applesoft BASIC, C-8  
Applications programs, 2-2—2-3  
ASCII (American Standard Code for Information Interchange), 63  
    codes listed for all characters, 4-3—4-4, I-1—I-5  
    *See also* International characters  
Automatic test. *See* Self test

## B

Bail. *See* Paper bail  
BASIC, 3-3, 4-3—4-7, 5-4  
    *See also* Applesoft BASIC; IBM PC BASIC  
Beeper, C-4  
Bold printing. *See* Double-strike; Emphasized; Proportional  
Buffer, Intro-1

## C

- Cable, 1-21—1-23
- Cancelling codes, 5-4
- Centronics. *See* Interface
- Character fonts, shown,
  - Epson mode H-3,
  - IBM Proprinter mode, K-3—K-5
- Character size, F-1
  - See also* specific widths by name
- Character string function. *See* CHR\$ function
- CHR\$ function, 4-3, 4-6
- Codes. *See* ASCII codes; Control codes; ESCape sequences; CHR\$ function
- Commands. *See* Control codes
- Condensed elite mode, 5-6
- Condensed mode, 4-2, 5-5—5-6, 5-11, 5-17
- Computer-printer communications, 4-3
- Control codes
  - Epson codes listed by function, G-5—G-34
  - Epson codes listed by number, G-2—G-4
  - Proprinter codes listed by function, J-7—J-27
  - Proprinter codes listed by number, J-4—J-5
  - See also* specific modes and functions
- Control panel, 1-16—1-17
  - Selecting typestyles. *See* SelectType
- Cover. *See* Access cover; Dust cover
- Cut-sheet feeder, 1-13, A-4, A-6

## D

- Data transfer sequence, E-3
- Defaults, A-1
- Density. *See* Graphics
- Designing graphics. *See* Graphics
- Dimensions of printer, F-3
- DIP switches, A-2-A-6
- Dot-matrix printing, 4-1—4-2
- Double-strike mode, 5-8—5-9
- Double-spacing, C-1
- DRAFT button, 1-16—1-17
- Dumping, hex. *See* Hex dumping
- Dust cover, 1-2, 1-4

## **E**

Elite mode, 3-3, 4-2, 5-2—5-3, 5-5—5-6, 5-11  
Emphasized mode, 5-7—5-8  
Environment, specifications for, F-3  
Epson computers. *See* QX-10 and QX-16  
Error warnings, C-4  
ESCAPE sequences, 4-4  
    Epson codes listed by function, G-5—G-34  
    Epson codes listed by number, G-2—G-4  
    Proprinter codes listed by function, J-7—J-27  
    Proprinter codes listed by number, J-4—J-5  
Double-width mode, 5-9

## **F**

Firing of pins. *See* Pins  
FORM FEED button, 1-17  
Foreign language characters. *See* International characters  
Formatting, page, 5-16—5-19  
Friction-control lever. *See* Paper-release lever  
Friction feed. *See* Paper loading, single-sheet  
Function switches. *See* DIP switches

## **G**

Graphics, 6-1—6-16  
    column reservation numbers, 6-10—6-11  
    designing, 6-11—6-14  
    densities, 6-8  
    nine-pin, 6-8  
    reassigning code, 6-10  
    string variables, 6-14  
    summary table, 6-9  
    troubleshooting, C-2—C-3

## **H**

Head. *See* Print head  
Hex dumping, C-4—C-6  
Horizontal tabs. *See* Tabs

## I

IBM Proprinter mode, Intro-1, 5-1  
character sets, 5-1—5-2, K-1—K-5  
command summary, J-1—J-27  
DIP switch settings, A-2—A-4  
international characters, 5-16  
print modes, 5-6—5-8  
self-test, A-3—A-4  
software installation, 2-2  
IBM PC BASIC, C-7  
width statement, 6-6  
Initialization, 3-5, 5-4  
Interface, 1-21—1-23, E-1—E-4, F-4  
International characters, 5-14—5-16, A-5—A-6  
Italic mode, G-13  
*See also* SelecType

## K

Knob. *See* Paper-feed knob

## L

Labels, self-adhesive, C-2  
Left margin. *See* Margins  
Lever. *See* Paper-release; Paper-thickness; Pin-feed  
LINE FEED button, 1-17  
Lid. *See* Dust cover  
Line feed, DIP switch for, A-4, A-6  
Line spacing, 5-18—5-19  
in graphics, 6-3, 6-6  
Location of printer, 1-2—1-3  
Lubrication, D-1

## M

Maintenance, D-1—D-2  
Manual-feed knob. *See* Paper-feed knob  
Margins, 5-17—5-18  
Master Select, 5-11—5-13  
Mode combinations, 5-9—5-10  
SelecType, 3-5

## N

Near Letter Quality. *See* NLQ

Nine-pin graphics. *See* Graphics mode

NLQ, Intro-1, 1-16-1-18, 5-6-5-7

IBM Proprinter mode, 1-18, 3-3

## O

OFF LINE button, 1-16-1-17

ON LINE light and button, 1-16-1-17

Overprinting, C-1

## P

Page

top of. *See* Top-of-page

formatting, 5-16-5-19

Panel buttons, selecting typesyles with. *See* SelecType

Paper

bail, 1-9, 1-13

feed knob, 1-2

paper-out sensor, 5-19

DIP switch control of, A-4—A-5

release lever, 1-11

separator, 1-14

thickness lever, 1-19, 1-20

Paper loading

continuous-feed, 1-7—1-13

single-sheet, B-1—B-4

troubleshooting, C-1

Parallel interface. *See* Interface

Parts, printer, 1-1

Pica mode, 5-3, 5-7-5-8, 5-11-5-12

Pin-feed paper. *See* Paper

Pin-feed holder and pin-feed locking lever, 1-10-1-12

Pins

firing, 4-1- 4-2, 6-2-6-3

labels, 6-4-6-5

Power switch, 1-15  
Print head replacement, D-1—D-2  
Print width summary table, 5-7  
    *See also* specific widths by name  
Print width. *See* specific widths by name  
Proportional mode, 5-11  
    width table, I-1, I-6  
Proprinter mode. *See* IBM Proprinter mode  
Protective lid. *See* Dust cover

## Q

QX-10 and QX-16, C-8

## R

READY light, 1-17  
Reset code, 5-4—5-5  
Resetting. *See* Reset code  
Ribbon  
    installation and replacement, 1-4—1-7  
Right margin. *See* Margins  
Rows. *See* Columns

## S

SelecType feature, 3-1—3-8  
    cancelling functions with, C-3—C-4  
    mode combinations, 3-5  
    mode numbers, 3-3  
    skip-over-perforation, 3-6  
Self test,  
    Epson mode, 1-20—1-21  
    IBM Proprinter mode, A-3—A-4  
Sensor. *See* Paper-out sensor  
Separator. *See* Paper separator  
Serial board. *See* Interface  
Setup  
    applications programs, 2-1—2-3  
    printer, 1-1—1-23  
Single-sheet printing, B-1—B-4  
Skip-over-perforation, 5-18  
SelecType, 3-6  
Spacing. *See* Line spacing; Proportional spacing  
Specifications. *See* Technical specifications  
Subscript, 5-13  
Superscript, 5-13  
Switches. *See* DIP switches

## T

Tabs,  
    Epson mode, G-19—G-21  
    IBM Proprinter mode, J-20—J-21  
Technical specifications, F-1—F-4  
Temperature, F-3  
Test. *See* Self Test  
Top-of-form. *See* Top-of-page  
Top-of-page, 1-18—1-19  
Tractor  
    removing, B-1  
    installing, B-4  
Troubleshooting, C-1—C-9

## U

Underline mode, 3-3, 5-10  
Unpacking your printer, 1-1—1-2  
User-defined characters, 7-1—7-7

## V

Vertical tabs. *See* Tabs

## W

Width  
    changing, 4-2, 5-3  
    dot patterns of, 4-2  
    of proportional characters, 1-4—I-5  
    statements, 6-6  
    summary table of, 5-7  
    *See also* specific widths by name  
Word processing, 49

**EPSON**

# **Quick Reference**

**FX-286 Printer**

---



## Control Codes by Function

The following control codes are briefly listed for quick reference. For a more detailed explanation, see Appendix G or J. Variables are not included in this quick reference due to their complexity. For those codes that contain variables, such as ESC “Q” (n) for setting the right margin, refer to Appendix G or J.

### Epson Mode (See Appendix G for detailed explanations of codes.)

#### Word Processing

Code	Dec	Hex	Function
ESC p	112	70	Select/Cancel Proportional Mode
ESC (space)	32	20	Select Character Space
ESC \$	36	24	Select Absolute Dot Position
ESC \	92	5C	Select Relative Dot Position
ESC a	97	61	NLQ Justification

#### Graphics

ESC K	75	48	Select Single-density Graphics Mode
ESC L	76	4 C	Select Double-density Graphics Mode
ESC Y	89	59	Select High-speed Double-density Graphics
ESC Z	90	5 A	Select Quadruple-density Graphics Mode
ESC *	42	2A	Select Graphics Mode
ESC ?	63	3 F	Reassign Graphics Mode
ESC ^	94	5E	Select Nine-pin graphics Mode

#### User-defined Characters

ESC &	38	26	Define User-defined Characters
ESC :	58	3A	Copy ROM into RAM
ESC %	37	25	Select User-defined Set
ESC 6	54	36	Expand Printable Code Area
ESC 7	55	37	Cancel Printable Code Area
ESC I	73	49	Expand Printable Code Area

#### MSB Control

ESC #	35	23	MSB Control Sequence Cancel
ESC = (equal)	61	3D	MSB = 0 Setting
ESC >	62	3E	MSB = 1 Setting

#### Other Codes

BEL	7	07	Beeper
BS	8	08	Backspace
CR	13	0D	Carriage Return
DC1	17	11	Select Printer
DC3	19	13	Deselect Printer
CAN	24	18	Cancel Line
ESC EM	25	19	Cut Sheet Feeder Control
ESC 8	56	38	Disable Paper-out Sensor
ESC 9	57	39	Enable Paper-out Sensor
ESC <	60	3C	Select Unidirectional Mode (one line)
ESC @	64	40	Initialize Printer
ESC U	85	55	Select Unidirectional Mode
ESC s	115	73	Select Half-speed Mode
DEL	127	7F	Delete Character
ESC i	105	69	Select Immediate Print Mode

**Character Width (Pitch)**

Code	Dec	Hex	Function
<b>SI</b>	15	0F	Select Condensed Mode
<b>ESC SI</b>	15	0F	Select Condensed Mode
<b>DC2</b>	18	12	Cancel Condensed Mode
<b>SO</b>	14	0E	Select Double-width Mode (one line)
<b>ESC SO</b>	14	0E	Select Double-width Mode (one line)
<b>DC4</b>	20	14	Cancel Double-width Mode (one line)
<b>ESC W</b>	87	57	Select/Cancel Double-width Mode
<b>ESC M</b>	77	4D	Select Elite Mode
<b>ESC P</b>	80	50	Select Pica Mode
<b>ESC g</b>	103	67	Select Fifteen Mode

**Print Enhancement**

<b>ESC x</b>	120	78	Select LQ or Draft
<b>ESC E</b>	69	45	Select Emphasized Mode
<b>ESC F</b>	70	46	Cancel Emphasized Mode
<b>ESC G</b>	71	47	Select Double-strike Mode
<b>ESC H</b>	72	48	Cancel Double-strike Mode
<b>ESC S0</b>	83	53	Select Superscript
<b>ESC S1</b>	83	53	Select Subscript
<b>ESC T</b>	84	54	Cancel Superscript/Subscript
<b>ESC —</b>	45	2D	Select/Cancel Underlining
<b>ESC !</b>	33	21	Master Select
<b>ESC 4</b>	52	34	Select Italic Mode
<b>ESC 5</b>	53	35	Cancel Italic Mode
<b>ESC R</b>	82	52	Select an International Character Set

**Page Formatting**

<b>ESC Q</b>	81	51	Set Right Margin
<b>ESC I</b>	73	49	Set Left Margin
<b>ESC N</b>	78	4E	Select Skip-over-perforation
<b>ESC O</b>	79	4F	Cancel Skip-over-perforation
<b>LF</b>	10	0A	Line Feed
<b>ESC 0</b>	48	30	Select 1/8-inch Line Spacing
<b>ESC 1</b>	49	31	Select 7/72-inch Line Spacing
<b>ESC 2</b>	50	32	Select 1/6-inch Line Spacing
<b>ESC 3</b>	51	33	Select n/216-inch Line Spacing
<b>ESC J</b>	74	4A	immediate n/216-inch Line Feed
<b>ESC A</b>	65	41	Select n/72-inch Line Spacing
<b>ESC i</b>	106	6A	Produce Reverse Line Feed
<b>FF</b>	12	0C	Form Feed
<b>ESC C</b>	67	43	Select Page Length in Lines
<b>ESC C0</b>	67	43	Select Page Length in Inches
<b>HT</b>	9	09	Tab Horizontally
<b>ESC D</b>	68	44	Set Horizontal Tabs
<b>VT</b>	11	0B	Tab Vertically
<b>ESC B</b>	66	42	Select Vertical Tabs
<b>ESC b</b>	98	62	Select Vertical Tabs in Channels
<b>ESC /</b>	47	2F	Select Vertical Tab Channel

## Graphics

ESC K	75	4B	Select Single-density Graphics Mode
ESC L	76	4C	Select Double-density Graphics Mode
ESC Y	89	59	Select High-speed Double-density Graphics Mode
ESC Z	90	5A	Select Quadruple-density Graphics Mode

## Other Codes

BEL	7	0 7	Beeper
BS	8	08	Backspace
CR	13	0D	Carriage Return
CAN	24	18	Cancel Line
DC1	17	11	Select Printer
ESC Q3	81	51	Deselect Printer
ESC 5	53	35	Automatic Line Feed
ESC 8	56	38	Disable Paper-out Sensor
ESC 9	57	39	Enable Paper-out Sensor
ESC U	85	55	Select Unidirectional Mode
ESC =	61	3D	Select User-defined Characters
ESC \	92	5C	Print from All Print Table
ESC ^	94	5E	Print One Character from All Print Table

## DIP Switch Functions

### Switch 1

No.	ON	Function	OFF
1-1	Condensed	Print mode	Pica
1-2	0 (slashed)	Zero character	0
1-3	inactive	Paper-out sensor	Active
1-4	Epson	Printer mode	IBM
1-5	Emphasized	Print mode	Standard
1-6	ON	International character set See Table A-2.	OFF
1-7	ON		OFF
1-8	ON		OFF

### Switch 2

No.	ON	Function	OFF
2-1	Active	Printer select	Inactive
2-2	Active	Cut-sheet feeder	inactive
2-3	ON	Skip-over-perforation	OFF
2-4	CR + LINE FEED	Automatic line feed	CR only

**Note:** The shaded boxes show the factory settings.

**Character Width (Pitch)**

Code	Dec	Hex	Function
SI	15	0F	Select Condensed Mode
ESC SI	15	0F	Select Condensed Mode
DC2	18	12	Select Pica Mode
ESC :	58	3A	Select Elite Mode
SO	14	0E	Select Double-width Mode (one line)
DC 4	20	14	Cancel Double-width Mode (one line)
ESC SO	14	0E	Cancel Double-width Mode
ESC W	87	57	Select/Cancel Double-width Mode

**Print Enhancement**

ESC E	69	45	Select Emphasized Mode
ESC F	70	46	Cancel Emphasized Mode
ESC G	71	47	Select NLQ (Double-strike) Mode
ESC H	72	48	Cancel NLQ (Double-strike) Mode
ESC I	73	49	Select Print Mode
ESC S0	83	53	Select Superscript
ESC S1	83	53	Select Subscript
ESC T	84	54	Cancel Superscript/Subscript
ESC -	45	2D	Select/Cancel Underlining
ESC —	95	5F	Select/Cancel Overscore
ESC 6	54	36	Select Alternate Character Set
ESC 7	55	37	Select Standard Character Set

**Page Formatting**

ESC X	88	58	Set Margins
ESC N	78	4E	Select Skip-over-perforation
ESC O	79	4F	Cancel Skip-over-perforation
LF	10	0A	Line Feed
ESC 0	48	30	Select 1/8-inch Line Spacing
ESC 1	49	31	Select 7/72-inch Line Spacing
ESC 2	50	32	Execute Line Spacing
ESC 3	51	33	Select n/216-inch Line Spacing
ESC 4	52	34	Reset Top of Form
ESC A	65	41	Set n/72-inch Line Spacing
ESC J	75	4A	Immediate n/216-inch Line Spacing
FF	12	0C	Form Feed
ESC C	67	43	Select Page Length in Lines
ESC C0	67	43	Select Page Length in Inches
HT	9	09	Tab Horizontally
ESC D	68	44	Set Horizontal Tabs
VT	11	0B	Tab Vertically
ESC B	66	42	Select Vertical Tabs
ESC R	82	52	Return to Default Tabs

## Notes

## **EPSON AMERICA, INC. LIMITED WARRANTY**

Epson America, Inc. hereby warrants that it will repair or replace, at its option, any part of the Epson product with which this warranty is enclosed which proves defective by reason of improper workmanship and/or material, without charge for parts or labor, for a period of one (1) year. This warranty period commences on the date of original purchase by the buyer other than for purposes of resale, and this warranty applies only if such original purchase by the buyer was made in the United States.

To obtain service under this warranty you must return your Epson product, properly packaged in its original container or an equivalent, to the nearest authorized Epson Service Center or the Dealer from whom the product was purchased. Any postage, insurance and shipping costs incurred in presenting or sending your Epson product for service are your responsibility.

The Dealer's original bill of sale or other satisfactory proof of the date of the original buyer purchase of your Epson product must be made available to obtain service under this warranty.

This warranty applies only if your Epson product fails to function properly under normal use and within the manufacturer's specification. Batteries, as well as optional software packages (ROMs) not contained in the original container of your Epson product, are excluded from coverage under this warranty. This warranty does not apply if the Epson label or logo, or the rating label or serial number, has been removed from your Epson product, or if, in the sole opinion of Epson, your Epson product has been damaged by faulty or leaking batteries not supplied by Epson, or by accident, misuse, neglect, or improper packing, shipping, modification or servicing, by other than Epson or an authorized Epson Service Center.

SOME EPSON PRODUCTS HAVE A COMPARTMENT CONTAINING STATIC-SENSITIVE ELECTRONIC CIRCUITRY. THIS COMPARTMENT IS CLEARLY LABELED. DO NOT OPEN IT! THIS WARRANTY WILL BECOME VOID IF YOU ATTEMPT TO MODIFY OR ADJUST ANY ROM OR OTHER PART OR DEVICE IN SUCH A COMPARTMENT, OR IF YOU ATTEMPT TO ADD OR INSERT ANY ROM OR OTHER PART OR DEVICE. IF ANY OF THESE STEPS IS REQUIRED, BRING YOUR EPSON PRODUCT TO AN AUTHORIZED EPSON DEALER.

THE DURATION OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, ON YOUR EPSON PRODUCT SHALL BE LIMITED TO THE DURATION OF THE EXPRESS WARRANTY SET FORTH ABOVE. IN NO EVENT SHALL EPSON AMERICA, INC. OR ITS AFFILIATES BE LIABLE FOR ANY LOSS, INCONVENIENCE OR DAMAGE WHETHER DIRECT, INCIDENTAL, CONSEQUENTIAL OR OTHERWISE, OR WHETHER CAUSED BY NEGLIGENCE OR OTHER FAULT RESULTING FROM BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, WITH RESPECT TO YOUR EPSON PRODUCT, EXCEPT AS SET FORTH HEREIN. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS AND SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS AND EXCLUSIONS MAY NOT APPLY TO YOU.

You may request information on how to obtain service under this warranty by contacting the Dealer from whom your Epson product was purchased, or by contacting Epson America, Inc. at the address printed below:

Epson America, Inc.  
Service Division  
23610 Telo Street  
Torrance, CA 90505  
(213) 534-4234

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

**EPSON®**

**FX-286™ Printer**

**User's  
Manual**

**Chapters Include:**

10-Step Setup Guide

Easy Near Letter Quality Selection

IBM Proprinter Mode

Dot Graphics

Typestyle Selection with SelectType

User-defined Characters

Special Print Features

EPSON AMERICA, INC.  
2780 Lomita Boulevard  
Torrance, California 90505